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# ALCOA ALUMINUM

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# AVIATION

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## ON SEA



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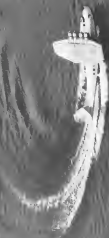
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## Reunion in Detroit

*Supplying exhibitors with prospects is the latest inspiration in show philosophy*

**I** AM putting you down for \$400, you may get your money back." That Barker Benjamin Young, vice-president, National Bank of Detroit, telegraphed a number of his clients, named the date to celebrate the 1935 Detroit Show, is held on June one day this spring. Since sponsors dared to consider profit possibilities, were promptly told that any surplus went to the Automobile Association of Michigan, who had courage to record the idea. Don't expect by other contributors was quickly of level by news that Rochester Ray Cooper, veteran of wars, six show managers, had assumed to take in the job again. Of course Benjamin Young would have been too smart to try this three years ago when such days in the auto business looked like Sunday afternoon. But the automotive depression is over (last year since 1929). People are buying cars (so our loans will what) at a terrific rate and the automotive industry's prospects are reasonable assurance of continuing welcome for the aviation industry in Detroit.

Out at the airport, distinguished by two superlatives—world's largest land mark (just south between runway) and world's largest hangar (\$1,800,000—held in the automobile industry), a





# Air Mass Soundings

*A fourth article in a series dealing with the fundamentals of modern meteorology. This one presents a résumé of the preceding articles and describes the use of the adiabatic chart, and begins the explanation of the Rossby diagram.*

By Philip Del Vecchio and Daniel Sayre

**T**HE AIR MASS THEORY of meteorology is based on the premise that large masses of the earth's atmosphere remain in a state of compression adiabatic over polar and tropical regions. There they take on definite characteristics of heat and moisture content. Portions of these masses are then usually moving irregularly laterally, moving for long periods in their migration certain air mass bands, which characteristics. As they meet and interact, they produce many of our weather phenomena, since each mass will rise under the warmer angles, lifting it, cooling it, frequently causing condensation and precipitation of its moisture.

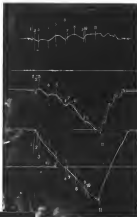
The distribution of the sources of the air masses over the area for which a forecast is being prepared has long been of major importance. A meteorologist with long experience in each half can, with fair success, plot the boundaries or "fronts" between the masses or, as soldiers say, at surface observations. As guides he might use marked differences of temperature between adjacent air-mass boundaries, wind-shift lines across isobaric configurations, or other phenomena.

But much more positive and accurate identification of the masses involved can be made by means of airplane soundings to study the vertical distribution of temperature and humidity. Such soundings have the further desirable feature of giving direct indication of the relative characteristics of the air at various levels above the sounding station.

## The soundograph

To make the soundings, the airplane carries a "soundograph." This consists of a 3-centimeter thermometer, an aneroid barometer, and a hair hygrometer. Combined, as desired, such recorded data known as a "three-in-one" sound, is recorded on a smoked sheet of lead foil on a clock-mechanism cylinder.

We indicated in our last article (March 1935) that a considerable amount of work is required to learn how the traces on the soundograph record into numerical values for the temperature and relative humidity at each level above the sounding station. It is an even longer task to manipulate these data into a form to yield the most reliable identification



Altitude meters	Pressure, mbars	Temperature, degrees Celsius	Relative Humidity, Per Cent
Surface	999	-4	85
100	922	-10	80
150	894	-12	75
200	866	-14	70
250	838	-16	65
300	810	-18	60
350	782	-20	55
400	754	-22	50
450	726	-24	45

from the sources of the air masses involved. But since the process is so important to the new meteorology, it is the technique of plotting soundings on a map has been in the older type of weather forecasting, and it is certainly worth our study.

Fig. 1 shows a smoked sheet record after it has been made ready for taking

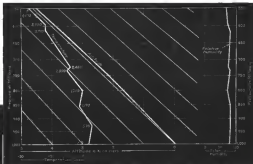


Fig. 2: The adiabatic chart for a sounding made at the MLL Army station at Earl Beach, 5 p.m., Jan. 31, 1935.

the indications of its curves. At the end of a sounding flight the drum has rotating on it but three regular curves. In the example above, the bottom one indicates the atmospheric pressure, the middle one the temperature, and the top one the relative humidity for each mass during the flight. Before the top is taken from the drum these curves are studied, and each curve the most significant points on them are selected for translation into numerical values.

In this figure, point 1 was selected to represent the conditions of

take-off conditions which are always determined in independent observations at the ground station. Point 2 was selected because it stood at the top of the first temperature descent with increasing altitude. Point 3 likewise is represented as actual increase in temperature through the next layer, and as an "isobaric point" at which the temperature curve changes its slope abruptly. In some graphs, though, diagrams of slope of the humidity curve will be isobaric point selection, or discontinuities may even occur in the rate-of-change curve and require it. In any case, when such a point is selected on one curve, it is marked not only on that curve, but also on the other ones. Thus three horizontal lines or reference lines drawn and the record is taken from the drum and preserved against detachment by a process which leaves the lamp-black permanently fixed to the surface of the foil.

## Known values

Each soundograph has, of course, been calibrated and is usually checked periodically in a low-pressure-low-temperature chamber such as has been used in the study of aircraft instrument performance. The known values for each curve at the instant of take-off are the base data to be assigned, accurate values. The value of any other point on any particular curve can then be obtained by measuring its ordinate value

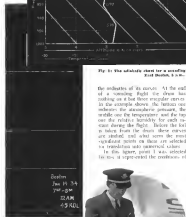


Fig. 3: (above) A typical record drum is mounted from a soundograph. The drum carries the relative humidity (100% to 10%), the temperature (1000 to 500), and the pressure (1000 to 500) curves. The points at the right show through the drum the relative humidity of the air mass during the flight. The drum is mounted from a soundograph.

the proper base line and translating it by means of the calibration curve.

The result is a table of pressures, temperatures, and relative humidities, such as are shown in the three right-hand columns in Table I. Practically, let us call attention to the item called "The relative humidity is, at several, even in the worst per cent when, the temperature in degrees centigrade, the pressure in millibars, the altitude in meters. We would suggest for other data in such a similar unit to an altitude assumed in Fahrenheit temperatures, pressures in inches of mercury, and altitudes in feet. But a student of modern aerology must have the fact that his subject is universally international and must learn to use the metric system from the start. The most satisfactory of the group used here, the millibar pressure unit, is equal to a decar per square centimeter. One thousandth of a millibar are equivalent to the familiar standard pressure of 29.92 in. (760 mm.) of mercury.

#### Altitude chart

So far, the temperature and relative humidity have been correlated with various atmospheric pressures, but not with altitude. Approximate heights could be assigned for each pressure, using some table or formula for a "standard atmosphere." But obviously, any such "atmosphere" which based on an assumption of a uniform drop in temperature and humidity with altitude will never exactly correspond to actual conditions because, as was pointed out in the March article, the rate of changing of these quantities is never uni-

form. Instead, the meteorologist plots the temperature and humidity against pressure, determines the average temperature and humidity distribution between such hundred millibar pressure level and figures accurately the thickness of a layer which would produce that pressure increment under those conditions. The result is the positive determination of an altitude-pressure curve from which it is a simple process to fix its deviation for each of the selected points.

The type of chart that is used in the process is shown in Fig. 2, and is known as an *altitude chart* because diagonally sloping lines are printed on it to indicate the slope of an altitude base rate. (A decrease in temperature of 1 deg. C. per 100 meters, equals in altitude.) Using these lines for comparison with the temperature curve plotted from the sounding, the meteorologist can judge at a glance which layers are suitable, or close to that condition.

So much for a brief description of the work that is generally done in such sounding station preliminary to the sending of data (shown in first of Table I) to the forecasting center. With the table in hand, the transmitted whatever usual observation the pilot had made of cloud formations, temperature, wind condition and the like.

#### The Rosby diagram

But these elements, as matter how plotted, leave a great deal to be desired in our mass identifications. In our first article (January) we attempted to describe how widely past these quantities of temperature and relative humidity

could vary in the neighboring air mass contained in clouds. We also brought to the fore certain atmospheric conditions, namely, the equivalent "potential" temperature and the specific humidity, stubbornly resistant to such changes. What the forecasters want, then, are curves of these conservative properties for the selected points. Fortunately, once equipped with the data yielded from a meteorographic sounding, he can figure them without further observation. In our next article we will take up in some detail the derivation attributes and importance of the resulting chart, known as the *Rosby diagram*. For those who have been trained in advanced thermodynamics, a perusal in the near future of Professor Rosby's M.I.T. pamphlet "Thermodynamic Applied in the Skat Caudron" is highly recommended.

#### Basic surface

As a brief preview, however, let us lay the broad outlines of the topic in closing here.

Once the temperature, pressure, and relative humidity of a particle of air is known almost any other convertible property it possesses becomes known. For example, there is nothing in the following formula for the potential temperature of the dry air which is not available in accurate tables.

$$(1) \quad \theta = T \left( \frac{P_0}{P} \right)^{\frac{1}{\gamma}}$$

where  $\theta$  represents the dry potential temperature, expressed in Absolute Centigrade degrees,  $(273 + C.)$ ,  $T$  the observed temperature, also in Absolute Centigrade;  $P_0$  the partial pressure which is equal to the observed pressure minus the vapor pressure of the moisture at the level in question. Now there are additional data needed for deriving the specific humidity by the equation:

$$(2) \quad W = \frac{P_v}{P - P_v}$$

where  $W$  is the specific humidity,  $P_v$  the water vapor pressure and  $P$  the partial pressure.

Since the equivalent potential temperature is a function of these two quantities, it is possible to plot these against each other and that have on a single chart almost every characteristic that you could have about in any mass. As we shall explain in more detail later, the slope of the curve gives a very accurate indication of the east state of equilibrium for each layer of mass. The grouping of the points indicates its turbulence. Finally the shape and location of the curve give a really satisfactory answer in the vast majority of cases as to the source of the various masses.

As an introductory example we offer the data which formed the basis of Table I and Fig. 2 plotted in Fig. 3A directly against altitude. In Fig. 3B it is shown plotted on a Rosby chart.

## L'Affaire Caudron

*Notes on the third Deutsch de la Meurthe Cup Race. In view of current interest in new forms of air racing in this country to encourage development of more efficient plane and engine designs for private owner use, the author's comments on this year's race and its racers are most appropriate.*

By R. J. de Marolles  
MARTINA, PAIR, Correspondent



Estimate the winner, across the Rhine River.

The two Caudrons at the starting line. The ship in the background is one of the ships with which racing was held. The ship in the foreground is the ship which was used for the race.

**B**y VIRTUE of three successive victories in its mass career by French pilots the trophy presented by Madsen's German Deutsch de la Meurthe has passed to the permanent possession of the Aero Club of France. Devel won it in 1931 as a Pétrel SL, and Armand pushed his Caudron 480 into first place in 1932. This year Debutiste with a Caudron 460 finished first, flying the 1,242-mile course in 4 hours, 36 minutes, 17 seconds, averaging 275.8 m.p.h.

Speed race courses generally do not exceed 300 miles or thereabouts, but Deutsch Cup competitors must complete twenty laps of a triangular course 62.14 miles (100 km.) around. Two flights of ten laps each are required. Competing machines are limited to power plants with displacements of 486.2 cu in. (8 liters) and must qualify by flying some 310 miles (500 km.) at an average speed of better than 166.5 m.p.h. (268 km/h.). They must be able to take off and land over an obstruction 3.38 ft. (1 m.) high with a total ground run of 1,540 ft. (468 m.).

This year's competition attracted eight entries of which five qualified. All were Caudron aeroplanes with Renault engines. Three of the five starters completed the full 1,242 miles,

Debutiste first as a 468 Lacombe second, also as a 460. Armand third as a 450. This year's performance list and times exceeded those of the past two years as indicated on an accompanying chart.

#### The machines

All 1935 racers are developments of the Caudron 360, which, with an engine of only 150 hp. finished a race once in the 1933 race at an average 197 m.p.h. This fairly of speed machines, designed by M. Lacombe, had assured many international records in the unhampered class, including the atmospheric speed record set by Debutiste at 313

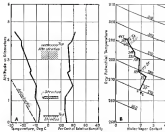


Fig. 3. Altitude and Rosby diagrams for the sounding upon which Fig. 2 was based. The figure on the Rosby curve shows the altitude of the points in case of interest.

up to a 450-hp with a 380-hp engine of 380 hp.

The Caudron 450 was entered but failed to finish. The machine is normally a two-place sports plane. For the occasion it was rigged as a single seater and powered by a specially recharged four-cylinder engine. Renault engine developing about 180 hp.

Caudron 450 and 460 are racers at almost identical design except that the 450 has wingspan 5 feet and the 460 retractable. Both are fitted with the semi-cylindrical inverted, in-line Renault 3R 450 engine with a nominal rating of 450 hp at 2,300 rpm.

The Caudron wing is a gull cantilever, in one piece, of cantilevered bi-concave section, built entirely of wood. The covering is of plywood with an outer skin of doped and highly polished fabric. The ailerons are self-sealing. Split-flaps are provided. They appear to be remarkably efficient, making possible perfectly normal landings with full load.

The fuselage and tail surfaces are of wood, built on the same principles as the wings and ailerons finished. The entire tail of Caudron is available from the cockpit. A sliding windbreak at semi-cylindrical form allows the pilot to fly either in the open for take-off and landing, or completely enclosed at speed.

The Caudron 450 fixed landing gear is made up of two cantilever shock units with struts and wheels well separated. The 460 retractable wheels are fitted with hydraulic shock absorbers and operating system. The driver has proven perfectly satisfactory, the wheels being easily retracted away made the wings almost immediately after the numbers leave the ground.

The engine is mounted on a composite structure of solid steel tubes and light alloy members. Welded magnesium is used for the cooling, as well as for the tanks. The propeller is a two-bladed metal. Battery model (similar to the new model on the D-15-Couat) is built from MacRobertson steel with two push settings, the low speed set on the low speed and the high to high being accomplished by electric pressure acting on a small



Top view of the Caudron 450, 1950 airplane

fuel plate on the piston after a predetermined forward speed has been entered. Once in high pitch, however, blades cannot be retracted low, except when stationary on the ground. The principal characteristics of the Caudron 460 are: span 22.15 ft. (6.75 m); length 23.4 ft. (7.125 m); height, 5.6 ft. (1.68 m); wing area, 254 sq ft. (23.6 sq m); weight empty, 1,800 lb. (810 kg); pilot and parachute, 176 lb. (79 kg); fuel and oil, 607 lb. (275 kg); gross weight, 2,086 lb. (950 kg); power loading 6.24 hp/lb. (13.6 kg/lb.); wing loading 27.8 lb./sq ft. (13.3 kg/sq m).

#### The engine

All three planes to finish were completed with the Renault 3R 450 engine designed by M. Cammaret, a development of the first Renault design four-cylinder engine. The cylinder is aluminum alloy reinforced by external ribs and carrying the four connecting rods. The

crankshaft runs on seven plain bearings. The cylinders are of composite construction with steel barrels and covered on aluminum alloy heads with a closely spaced cooling fan. Valve seats and guides are of special bronze. Valve gear is of the push rod and rocker type, modern valves on special seats. Connecting rods are of forged steel. Pistons are of forged aluminum alloy cast with five rings. All assemblies are driven from a single gear mounted on the rear of the crankshaft. Dual ignition is provided by Scintilla magneto. The supercharger is of the Renault centrifugal type driven from the rear of the crankshaft through a torque limiting device. All gears in the supercharger drive train are mounted on bronze bearings. A single-belted Scotch-Screwdriving is fitted. Fuel is supplied to the carburetor through two mechanical pumps. Chloral is used as the lubricant. It is circulated by one pressure and two scavenger pumps. The Vent compressed air starting system is used. Air is supplied from cylinders which are part of the general equipment.

The specifications of the Renault 450 are: bore 4.31 in. (109.75 mm); stroke, 5.51 in. (140 mm); displacement 461 cu in. (7.56 liters); weight dry 536 lb. (240 kg); compression ratio 6.5 to 1; supercharger pressure 8.5 lb. per sq in.; normal rating 300 hp at 2,300 rpm; specific weight 14 lb./hp. (3.22 kg. per hp).

#### The future

Although France now has permanent possession of the cup, it is estimated that the race will be continued for another three years under a new set of regulations now under consideration by the Comité Cassinier. It seems likely that the principle of having racers by engine capacity will be retained, but some change in the displacement selection is obviously necessary. The absence of foreign competitors in this year's race was probably due to the fact that the 8-liter limit failed to correspond with engines in current production as are equally novel. France. In other words, the need for an international displacement class has long been recognized. Such a cap for action would be of great benefit in increasing interest in international racing and would provide a strong incentive to the improvement of design progress.

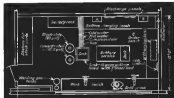
No more connecting pool of the benefits of the Datascope to the American equipment is available than the conventional improvement in efficiency and speed over the three-year period which led to the entry of a new world's best plane speed record by Delatour. Beyond all doubt, not racing over long distances is one of the best methods known to improve the best.

## Battery Chargers

On the care and feeding of storage batteries as seen in maintenance departments of airlines here and there about the United States

By S. Paul Johnston

Associate Editor, AVIATION



1. 100-amp. battery, mounted on a 12-volt. 2. 100-amp. battery on the charging line. 3. 100-amp. battery on the charging line. 4. 100-amp. battery on the charging line. 5. 100-amp. battery on the charging line. 6. 100-amp. battery on the charging line. 7. 100-amp. battery on the charging line. 8. 100-amp. battery on the charging line. 9. 100-amp. battery on the charging line. 10. 100-amp. battery on the charging line. 11. 100-amp. battery on the charging line. 12. 100-amp. battery on the charging line. 13. 100-amp. battery on the charging line. 14. 100-amp. battery on the charging line. 15. 100-amp. battery on the charging line. 16. 100-amp. battery on the charging line. 17. 100-amp. battery on the charging line. 18. 100-amp. battery on the charging line. 19. 100-amp. battery on the charging line. 20. 100-amp. battery on the charging line. 21. 100-amp. battery on the charging line. 22. 100-amp. battery on the charging line. 23. 100-amp. battery on the charging line. 24. 100-amp. 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along toward solution, but the operator is still with him. He must maintain a large battery inventory, and undertake heavy annual replacement against limited battery personnel and adequate charging equipment at diversion points and overhaul bases.

In touring maintenance shops at over the country in the past year or two, we have seen a great many variations to the battery servicing chain. A number of examples have been selected which are representative of the best in modern flying practice. They may provide helpful leads to the small airline about to undertake a program of expansion, or to the airport operator whose customers are beginning to think in terms of two-way radio and de-icing aids.

#### United Air Lines

United has one of the most highly organized systems in the country for the care and maintenance of its transport battery equipment. Its main overhaul base at Chicago is fitted up with a battery shop equipped to build and re-build batteries from scratch to terminal life. It makes a full-time job for one man to keep things moving. All batteries on the system are scheduled so that they pass through the repair



Latest and best out of Western Air's battery shop formerly at Atlanta and at Miami



shop at least once every 30 days, and as diagnostic system of records is kept covering the life and behavior of each unit. Careful checks are maintained on batteries as service units from Chicago. Any plane held at a terminal station receives a thorough test at lights and radio; then the battery is removed and placed in charge. A fresh, serviceable battery from the store's stock is then substituted immediately prior to the scheduled departure. Tests of voltage and gravity are made at the station, battery being considered serviceable as long as they show a gravity of not less than 1.275 and a cell voltage of 2.6.

Equipment based at Newark is typical of other U.A.L. stations. This consists of a Model 1205 B & K two-belt charger (John Bean Mfg. Company), capable of handling six or seven batteries at a time. The charging compartment is much more elaborate as indicated in the drawing and photograph on the preceding page.

United does not purchase new batteries in a hurry. Chevrolet makes up for necessary 12-volt 6-cell 35-amp

non-spillable batteries from both Willard and Radio Shack. One of the accompanying photographs shows how the plates are assembled in a jig. This jig is similar in principle and design to that used in battery factories in the large industrial battery overhaul stations.

An interesting feature of United's battery assembly is the use of this potential rubber charging on each side of positive plates. Experience has indicated that the life of the battery is dependent upon the rate of desorption of the positive element. By speeding the process, battery life has been practically doubled. The regular wooden separator must of course be made thicker to allow for the thickness of the rubber sheet.

After an assembly is completed or an old battery rebuilt, it is placed on charge at a low rate for 56 hours, at which time the cell voltage should read 2.7 while still on the line. Cadmium tests are then made on high positive and negative plates. Positives should have a reading of at least 2.6; negatives a reversed reading of 0.125 or more. At the completion of the initial recharging charge, the battery is discharged on a standard discharging panel. Any battery with an rated capacity of less than 70 minutes as compared with a standard discharge curve is not considered satisfactory for service. If the battery meets discharge

requirements, however, it is recharged, closed up and placed in service. Similar test discharges are made at the end of the first 120 days of battery life and each 30 days thereafter or at any time when a battery appears questionable re: when cell voltage (while still on charge) varies between 2.5 and 2.6 in fully charged condition.

#### Eastern Air Lines

Standard equipment for Eastern Air is the Model 6-XT-13 battery. Main base for battery overhaul is now at Miami (formerly at Atlanta), where the equipment shown in the accompanying drawing is installed. Stations at Newark and Washington have 1000 constant potential chargers similar to the base installation except that the capacity in both cases is only 50 amp. Other stations along the line are equipped with Tanager 15 cell chargers built by General Electric.

Batteries are checked in place at the end of each day's run. If the specific gravity falls below 1.285, the battery is

removed from the plane and put on charge. If there is any doubt about the battery after charging, it is returned to the base and a high rate discharge is given at 70 amp. for twenty minutes (or about 70 per cent capacity). If on such test the voltage does not drop lower than 1.35 for any cell, the battery is considered satisfactory. Complete records of the life of each individual battery are kept at the base. During 1954 the base had some 72 work-in-service and were replacing them at the rate of about 60 per year.

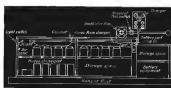
#### TWA

Exide 6-XT-13 batteries are also standard for TWA. Some 70 units are required to take care of active schedules and to provide necessary spares. At terminal stations, repairs are usually started with an external battery test. Normal Model 6-XT-13-100-1300 are maintained for this purpose.

To fix all other items of flying equipment, Kansas City is the base for battery overhaul. The charging stand



Northwest's serial and constant charging station. When batteries are on charge, the cabinet doors swing open in the adjacent air venting system to keep the plane. Through air returns the cabinet through overhead openings at the outside wall and through lower ducts in the cabinet floor. Gases are removed by the fan at the right. Below: The cabinet closed with the entire cabinet unit shipped in the charging



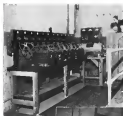
shown is one of the accompanying photographs is a Willard 100 amp constant potential charger with a capacity of from 30 to 50 amp-hours per day. It is a fixed unit at Kansas City. But in many places are given a thorough inspection by the electrical and radio departments, after which the storage battery must be removed before the plane is moved into the hangar.

Complete records are kept of all batteries at Kansas City, and 5-day battery charges are made each day from the base, a full report of the condition of the battery taken out must immediately be made to headquarters. Field managers at outlying points are also responsible for reporting the condition of batteries in charging units.

#### Northwest Air Lines

Northwest uses the Type T7B-13-6 Willard fixed rubber anodized batteries exclusively. These batteries carry a rating of 60 amp at twenty-hour rate and 40 amp at the twenty-minute rate. Out of 26 batteries purchased since June 1952, only four have been returned to the manufacturer for repairs. For station service in motor batteries, the Willard Type 6-XT-130-140 rated at 100 amp at twenty-hour rate, is used.

Most recent feature of Northwest's battery servicing system is the charger installation at St. Paul. The charger (General Electric Tanager, 220 amp, 30 cell, capacity-50 batteries) is mounted on the wall at a convenient height. The charging line proper is enclosed in a long wooden cabinet in one corner of the hangar. It has two shelves, the upper one on which the batteries rest during discharging and a lower where they are placed when fully charged and ready to go into service. The cabinet has its own lighting system and is ventilated with an electric motor and fan which draws fumes from the batteries and discharges them through lower set in the window above the cabinet. The whole arrangement is completely self-contained. Batteries are out of the way and are protected from damage during charging.



TWA's battery shop has equipment in the corner of the main hangar at Kansas City.

Right: A typical American Airlines installation—the battery plant at the Port of New York.





the working surface smooth by buffing with a wire wheel or by scraping and sanding.

The top half, or punch, is made from an alloy of lead and antimony, and is formed by pouring directly on the sand die. The die is surrounded by a wall of wood into which the lead is poured, similar in the manner in which the pattern is made. A slight amount of shrinkage will occur in the punch after cooling. The shrinkage may be sufficient to entirely compensate for the thickness of the metal to be stamped, or it may be too great and a slight gap will occur in the punch after cooling. It is usually necessary, however, to draw down the punch to smooth it and to obtain the approximate clearance between the stamping and die. No great amount of force need be exerted in drawing the punch, as it (being the softer metal) will conform to the die and take it for the when stamped a few times in the hammer thus adjusting any small clearance discrepancies.

Punches made of lead alloy have a distinct advantage over those made from harder materials. The proper alloy of lead and antimony will give sufficient strength in the punch without making it so hard as to crack whenever it is stamping. It is soft enough to allow the metal to draw when being formed and to accommodate itself to the shape of the die die. In equivalent is found in the lead band hammer in common shop use.

#### Operation of the hammer

Setting up the dies in the hammer is a simple operation, requiring, on the average, twenty minutes time for one man using an overhead crane and least with skill to handle large dies. The die may be secured to the steel by lugs or by surrounding it with molten lead about as thick as thickness. The punch is inserted in the hammer by means of belts, the handle of which are set in the punch at the time of pouring.

The rise and fall of the hammer is

controlled by a rope to which the hammer is attached. The punch is raised through the overhead drum, the free end being accessible to the operator. A slight pull on the rope by the operator will cause it to wind up on the revolving drum, which causes the hammer by frictional contact between the rope and drum. Slacking off on the rope causes it to slip around the drum, allowing the hammer to fall. Heavy blows or light taps of the hammer may be struck at the will of the operator, simply by regulating the distance through which the hammer is allowed to fall.

Difficult pieces may be formed by gradually working the metal into the die by a series of rapid, light hammer taps and finishing off with one or two hard blows to strain the final form. Simple pieces require but one blow as a rule, when the metal is of very heavy gauge.

Hot metal steel or Alclad may be stamped successfully provided there is little drawing required of the metal. They draw more rapidly than the use of soft metal which, if necessary, may be heat treated after stamping. After heat treating it is re-tempered to take out any warping or cracking. In some cases, however, it may be necessary to heat treat the metal first and stamp it directly after quenching allowing it to age after forming.

Stamping steel requires a different procedure as it is more difficult to work than steel. It is first stamped, then annealed, pickled, and oiled, and stamped again. Pickling not only removes scale but improves the working qualities of the steel. It is essential to remove all scale otherwise the stamping operation would draw it into the punch, and damage the stampings.

#### Manufacture of templates

Aside from the direct stamping resulting in the primary production of forced sheet metal parts another con-

ting is possible through the use of the drop hammer in the making of templates for subsequent drilling and trimming operations. Before beginning to put the detail sheet through the finished dies, a piece of sheet steel of suitable gauge and length is hammered out to the exact shape of the finished piece. The steel action is then stamped up by hand to exact finished dimensions and the desired drilling pattern is laid out on it in accordance with the production drawings. The steel piece then serves as a master pattern in template dies which all of the subsequent drop production pieces may be laid out, drilled and checked. The template can only secure differently of any given production run, but may be stored away for checking future die usage. Thus all parts made from the original die may be standardized and made interchangeable.

#### Cost comparisons

To arrive at a cost comparison which will fairly reflect the maximum savings derived through the use of stamping is difficult if not impossible, but as there are many indirect economies not readily ascertainable in dollar and cents. It is difficult to accept for the actual total weight saved, the number of parts or bolts fabricated, or the assembly of several parts into one or two stampings. Also it is difficult to estimate what is saved through uniformity and accuracy of drop hammer stampings, but it is known to be appreciable. According to one source with future realizing its anticipated production total, it is shown that replacement parts may be reduced up to 50% in important maintenance construction.

Comparative time required for parts made by hand and the equivalent parts stamped is shown in the table. In order to make a fair comparison and one which might be useful as a basis for estimating expected profits derived by the installation of drop hammer equipment, one heavy used one thousand. Weigh, overhead, and manufacturing facilities very with individual organizations. It is believed, therefore, that time factors a more accurate basis of comparison. Items included were selected on account of their common occurrence in many all types of aircraft and because Simple Alclad and wood were used in their construction and practically the same as drop hammer dies for the same parts. The data were obtained from ten sets of each made by hand before the drop hammer test is made, after which ten more sets were stamped. Average time for each set is shown for both methods. Time is for actual labor involved in making and assembling the parts. These data represent results obtained by the Avia Development Corporation manufacturing of the Vulture transport

## Tomorrow's Pilots

Flight instruction goes to high school, lightens the Latin teacher's task



Here to practice

By Leslie E. Neville

Managing Editor, Aviation

SIX HUNDRED crews of New York's schools, Teachers' N. J., joined in their nation's celebration of the centenary of bridge and towers while 300 high school students overjoyed especially their planes to a question which is presented problem. The question is: "Why do we include flying in our regular high school course?" The combined anxiety of students and its control only by that of Arthur G. Norwood, organizer of the idea, when 300 schools replied in a unanimous affirmative. Scholarship was then awarded as the organizing factor in reducing the 300 to 80 maximum capacity for the class, grades in Latin and (science) history were noted.

The ready acceptance of such a revolutionary idea is less remarkable when it becomes known that Transport Pilot Norwood had been hunting the same bridge school and other local challenges for months, promoting the concept of aviation. His effective selling had the

The trouble Norwood is more difficult than the task which the first master in flight is to solve the problem.

Having before him the idea of a flying school, Norwood is now in a position to make a very large idea of the school.



Mr. Walter Norwood would be required to see this "Barnard" on the third of his own to build before the Teachers' Union. (Norwood) (right) shows an illustration of a plane to his students.

COMPARATIVE TIME FOR PARTS MADE BY HAND AND BY DROP HAMMER

Item	Hand		Drop Hammer		Weight
	lb.	oz.	lb.	oz.	
Flange plate for transport door assembly	14	11 30	22 30	47	21
Flange plate for engine case	14	11 30	15 30	41	15
Wrenching bracket	26	12 30	13 30	44	15
Wing for fly half	12	4 30	13 30	41	14
Engine bracket for engine plate	8	10 30	10 30	31	14
Accessory tank base	6	4 30	13 30	41	14
Accessory tank base	6	4 30	13 30	41	14
Flange plate for fly	100	10 30	10 30	41	14



Roller rings the allowable stress is proportional to the volume of the stainless steel, since this elastic range extends only to a unit stress of 60,000 lb. per sq. in. it is important, from a collapse standpoint, to have a high modulus only up to this unit stress. In other words, there is no need for the proportional limit to extend beyond 60,000 lb. per sq. in. as far as collapse is concerned. From test results it seemed entirely feasible that 18-8 stainless steel can be applied successfully with a proportional limit as low as 75,000 to 100,000 lb. per sq. in. and an initial tangent modulus of 25,000,000.

This material as received would be slightly more efficient than a weight-weight straight design that the present chrome molybdenum tubing had produced to 100,000 lb. per sq. in. The yield point of stainless steel is 140,000 lb. per sq. in. at a yield point of 140,000 lb. per sq. in. for chrome molybdenum tubing treated to 100,000 lb. per sq. in. At first aid in predicting loading is satisfactory but the stainless steel, its weight would be less than that of chrome molybdenum.

#### Aluminum comparison

Curve 4 of Fig. 3 is an allowable stress curve for 24 ST aluminum alloy taken from the Army Handbook. It should be noted that the maximum allowable compressive stress of 52,000 lb. per sq. in. is due to crippling failure of the 24 ST aluminum alloy. As the present aluminum alloy tubing was examined to only 3 per cent lower than the permitted one, the weight ratio was, therefore,

$$\frac{188}{274 \times 1.03} = 1.70$$

Curve 3 of Fig. 2 was obtained by multiplying the volume from Curve 4 by a weight ratio factor of 1.70.

The difference between Curve 3 and Curve 2 represents the additional unit stress that a stainless steel tube of the same length, diameter, and wall thickness as an aluminum alloy tube. As the modulus of elasticity was in actual fact a stainless steel value ( $E = 29$ ) of less than 100, examination of Fig. 2 shows the marked superiority of stainless steel in the long column range; the ratio of the unit stress of Curve 2 to Curve 3 is 1.06, thereby showing that a stainless steel column is approximately 4 per cent more efficient in compression than an aluminum alloy column even when in the Euler range. Because the value of compressive yield for stainless steel has an initial modulus of only 26,000,000. As previously noted, this represents the lowest value of modulus for stainless steel and is more than 100% lower. It is assumed that in high tensile steel, the modulus will be as low as 100,000.

The aluminum alloy column can be chosen to be about 7 per cent more efficient than the stainless steel in the long column range. As the efficiency of the stainless steel compared to the aluminum alloy when steel is as a column, in the Euler range is from 1.4 to 2 per cent to 2 per cent, for all practical purposes it can be considered equal in strength-weight ratio. In comparison, as stainless steel carries a much higher ratio of unit stress in the short column range and is approximately as equal ratio of unit stress in the long column range, it is definitely better than aluminum alloy, considering similar size tubes, for all-around usage as a column.

#### Tube selection

If a given compressive load is to be carried by a tube and the unit is not restricted, however, stainless alloy has a definite advantage over an ordinary steel tube. Considering standard wall tubes of equal weight the aluminum alloy tube has a larger diameter than the steel tube and, hence, a smaller deadweight ratio. An steel tube Fig. 2, a stainless steel column  $L/D$  of 68 will carry a much load as an aluminum alloy with  $L/D$  of 55 due to the higher allowable unit compressive stress of the stainless steel. This results in some gain for stainless steel, but in general aluminum alloy standard size tubes are superior for compressive loads when the use of the tube is not limited.

Fig. 3 is similar to Fig. 2, except that the stainless steel is compared to 17 ST aluminum alloy. The difference between the allowable unit stress in the short column range is much more pronounced in this case, as 17 ST aluminum alloy is decidedly inferior to 24 ST aluminum alloy. This is shown by comparison of the two straight line formulas for allowable unit stresses. In stainless steel tube value is 40,000 lb. per sq. in., whereas the maximum unit stress of 24 ST aluminum alloy is 52,000 lb. per sq. in. The

17 ST aluminum alloy is more easily welded, however, as it is somewhat easier to work and handle. Again, stainless steel will carry a higher weight, the difference being more marked than before. As seen in Fig. 3, a stainless steel tube with a deadweight ratio of 1.4 will carry as much load as a 17 ST aluminum alloy tube with  $L/D$  of 29. Since a 17 ST aluminum alloy tube will carry as much compressive load as a 24 ST aluminum alloy tube when used as an Euler column, it has approximately the same efficiency as stainless steel in this range.

The spread between aluminum alloy and steel standard size tubes is rather marked. For example, suppose that a compressive load of 50,000 lb. is to be carried by a pin loaded steel tube  $1\frac{1}{2}$  in. long. A 24 ST aluminum alloy tube is  $1\frac{1}{2}$  in. long, will carry 30,500 lb. and weighs 1.33 lb. (neglecting end fixtures), while a 17 ST aluminum alloy tube will carry 3,600 lb. The most efficient chrome molybdenum tube of the same weight is 1.5 in. in length will carry a load of only 2,700 lb. A 1 $\frac{1}{2}$  in. (efficiency chrome molybdenum tube will take the 9,000 lb. but the weight is then 2.18 lb. This example also shows that a fairly extreme case at the aluminum alloy tube in the short column range while the steel tube is in the long column range, thereby giving a large difference in allowable unit stress.

#### Build-up tubes

Tests have been run on this wall stainless steel tubes under direct compression. A half-inch, pin-loaded tube 2 in. GD with 40 in. wall, 37 in. long, weighed an overall of 50.36 lb. This tube weighed 1.44 lb. but as no protective coating was needed, as weight and that of the present aluminum alloy tube (deducted above) were about equal. The tubes are of approximately equal weight and the stainless steel built up

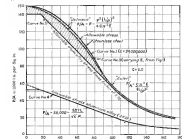


Fig. 1—Johnson-Euler curves 18-8 and 24 ST

tube carries slightly more load than the aluminum alloy tube. As the column length drops so that the stainless steel is also in the short column range, the stainless steel shows up to still greater advantage. As pointed out previously, it is possible to reinforce still further the stainless steel composite stress on short columns by running bands longitudinally along the column to act as stiffeners.

External wing, tail and engine mount stress must be kept as small as possible in the interest of aerodynamic efficiency. Stainless steel can be obtained with a substantial increase in overall efficiency when actual design conditions bear the overall sum of material (due to stresses, stress concentrations, etc.) is less than standard size tubes can be used for great advantage.

#### Corrugated sheet

As pointed out in a previous article (AVIATION, June, 1932) composite panels of flat and corrugated sheet, riveted or welded together, are being widely used in aircraft structures. The proportioning of the flat and corrugated elements vary with individual usage so that the comparison between stainless steel and aluminum alloy combinations are outside the scope of this article. A comparison between stainless steel and 24 ST aluminum alloy corrugated sheet, however, when tested in compression with flat ends showed a decided advantage in favor of the stainless steel. The test refers to thickness ratio (R/T) of the corrugations of the stainless steel specimens was compared by the weight ratio factor, 2.85. Thus a stainless steel

working range of aluminum alloy is in the neighborhood of 50 it can be readily seen that it is possible to effect a weight saving in this type of structure of 10-15 per cent by using stainless steel rather than 24 ST aluminum alloy. As pointed out before, the close permeable ribs in the sheet enable lowering the flat sheet to the corrugation enables the maximum moment of the sheet to work with the corrugation.

A stainless steel wing spar designed for a normal sea airplane design the high unit stress of 104,000 lb. per sq. in. is the highest unit stress usually encountered in 24 ST aluminum alloy is approximately 50,000 lb. per sq. in. If the assumption is made, however, that a unit stress of 52,000 lb. per sq. in. could be developed, the stress ratio would be 104,000/52,000 or 2.0. Neglecting protective coating on aluminum alloy, the weight ratio between the stainless steel and aluminum alloy is 2.84. Dividing the stress ratio by the weight ratio, stainless steel has an advantage of approximately 13 per cent over the best design of 24 ST aluminum alloy use. If protective coating were to be considered for the stainless steel, a weight saving of approximately 20 per cent would result from use of stainless steel.

With proper design, stainless steel can be used in aircraft structures with a saving in weight over other materials. The airplane with high wing loading or the large transport with high unit stresses will require additional stress design (results are definitely in such direction it seems likely the stainless steel will offer increasing competition to the aluminum alloy in the aircraft field.

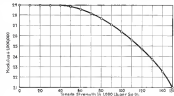


Fig. 2—Stainless vs. Steel stress-volume chart

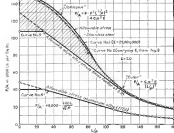


Fig. 3—Johnson-Euler curves 18-8 and 24 ST



## Editorials

AVIATION

EDWARD P. WATKINS  
Editor

## Back to Detroit

**F**OR THREE YEARS now we have been talking of aircraft shows in a somewhat theoretical fashion, and the longer we got along without them the more our abstinence seemed to count. But it never came any to Detroit, where the habit of entertaining the aircraft industry each spring was finally established.

From the point of view of display of industrial progress it is so clear that three years was becoming too long an interval between shows in that a single year had become too short. Automobile manufacturers, like Persian dress designers, have learned to incorporate changes of a periodically arbitrary order in their new models where they have no real and conspicuous progress to offer, in order that the man with an out-of-date car may always be identified by its shape and general make-up and so be induced to the home of his neighbors until he steps out and buys a new one. It isn't so easy to do that with aircraft, and possibly speaking airplanes show changes in appearance only when synchronous advance or genuine development in detail design call for it. That aircraft happens in a degree sufficient to produce very conspicuous changes in the content of an industrial display in less than a two-year period, but the two-year period has now stretched well beyond three since our last show was held, and the change in airplane designs in that period has been conspicuous indeed.

It is to be hoped that in these three years and more we have learned something of the purposes and the possibilities of shows, and that we have and ourselves permeated of some of those various notions that the automobile industry has been twenty years in shaking off. The most absurd of the lot perhaps is the idea that no human eye should ever before have looked upon any of the aircraft put on display, and that the opening day of a show should be the occasion for a breathless scrutiny by every manufacturer of new models therefore kept under lock and key. The leading builders of automobiles have long since learned to respect their own customers in the announcement of their new models,

and to pay attention to only two things—the readiness of the cars for the market, and the readiness of the market for the cars. Aircraft builders will be well advised to do the same and to take shows in their stride, displaying whatever they have ready for sale at the time.

If that point can once be fixed on, we shall be able to do much less grumbling than is now the rule about the dates of shows. When showing in April was the common practice there was a constant millions movement from manufacturers who possessed their whole selling season spent. It certainly was true that local operators, anxious in their own minds about their plans, were likely to hold off on closing contracts until they had looked the show over. Now that a show is proposed for July the same protest is heard again, but with a good deal less reason. A July date, paradoxically, is as bad as that it's good. Dealers and manufacturers may possibly hold off until April, on account of a show, schedules and plans that should have been completed in February. They certainly are not going to hold them off until late mid-summer. A July exhibition can hardly appear as an occasion for 1935 model announcements to the industry. It will stand rather as a prompt for concentrating mind and by showing directly to the prospective customer and for boosting the general average of public aircraft knowledge and so helping along the traffic of air transport and other operations.

In that connection the mid-summer date ought to be perfectly feasible. By a year from next winter, on a date somewhere between the first of December and the middle of February, we ought to be taxed up for another general national display addressed particularly to the industry's own personnel, and most particularly of all to dealers the country over. In the meantime the pathing in Detroit this month promises to provide a record not only of the progress that aircraft design has made in three years but of the progress that showmanship and record in that purpose of attracting crowds and then converting them into ready men or willing purchasers of aircraft. Incidentally, it will serve as a benchmark, to be closely observed by Chambers of Commerce

and by aircraft dealers the country over, of the present possibilities of business returns from such exhibitions.

## Twin-radioed Airplanes?

**I**T IS GENERALLY AGREED among airline operators that multiple power plants and the capacity to fit with one of them imperative are good things. In the face of really remarkable progress in engine reliability (due both to improvement in original design and to better maintenance methods), the possibility of unexpected failure still cannot be completely disregarded, and over three-fourths of America's air transport is now carried on in multiple engine ships.

The history of public feeling on the power plant subject ought now to be well and carefully considered by airline executives, especially those responsible for communications, but sooner or later they be forced to accept equipment specifications that might be extremely detrimental to them. It is not impossible that the argument that has been made for duplicate power plants may be made with increasing frequency and increasing force for duplicated radio equipment.

Five years ago the radio, if it was carried at all, was considered more a convenience than a necessity. Five years ago, too, the percentage of trips unsuccessful was more than twice as great, and the record of passenger safety only one-tenth as good, as in the first six months of 1933. To have put 1930 on the same level of safety as the current year, many trips that were actually flown in doubtful weather should have been canceled, and the year-around percentage of completed trips would have dropped to well under 50 per cent, instead of the 92 per cent actually recorded. In other words, the high degree of safety now attained, coupled with schedule regularity of some 95 per cent, must have all else be credited to the amount of the radio. Year in and year out about 20 per cent of average airline operations are conducted under conditions that are perfectly safe with radio, shockingly dangerous without it. In that 20 per cent, the airplane and its cargo are as dependent on the radio for safety as on the engine.

Complete duplication of radio, if it should be insisted upon, would impose a rather alarming burden of weight and sacrifice of payload. It ought to be avoided if it can be without sacrifice of safety, but every report of radio failure or of radio misbehavior will make avoidance more difficult.

Short of complete duplication, there are several alternatives to bring radio performance closer to the goal of 100 per cent reliability, the absolute minimum. Radio designers can make their sets still more rugged and can to some extent make them self-

diagnosing in respect of the parts most likely to cause trouble, precisely as engines are furnished with dual ignition and become with automatic belt-changers. It may be a good idea, at least it would be deserving of careful study, to encourage radio installations, to locate them between the cabin and the cockpit where the cockpit can get at them in flight, and to require that cockpit and in their present qualifications the ability to check over radio sets for the constant menace of trouble and to make running repairs from a small stock of spares. No running operator is allowed to go to sea, however great his proficiency in standing, without being able to take care of his set and put it right when it has gone wrong. It may be necessary to demand as much from some member of the air transport's crew, and to qualify the training schedule accordingly.

But however that may be, on one point there can be no delay and no doubt. The radio must be recognized as an essential part of the airplane. A transport man no more be allowed to take passengers into the air with an imperfectly functioning radio, whatever the circumstances, than to take off with one engine running up 1,200 r.p.m. simply because the machine can fly on the remaining engine alone. There is even less excuse for flying with radio out of action in any respect than for starting off with one engine bad, for the engine has to be repaired in the ship and the efficiency of some obscure trouble may take hours, whereas the replacement of a troublesome radio from a stock that ought to be maintained at strategic points should be a matter of only a few minutes. If the airline want at the same time to keep their records clean and to keep clear of the imposed necessity of looking on another two or three hundred pounds of non-paying load, the imposition of a rigorous and unvarying standard of absolute perfection in radio and instrument servicing must be their constant concern.

## Persecution's End

**T**HE SECRETARY OF WAR has made his inquiry, and arrived at his decision. General Respublic D. Foxford remains in the office to which he was duly appointed by a legally valid vote by the President of the United States.

Little more need be said. The first approach to the very business in anything resembling a polished spirit put an end to it without delay. The initial manner of procedure would have been outrageous in any case. Now that the major changes in lightness and irresponsibly projected have been found free of substance, the mind of the affair becomes doubly an outrage, and ridiculous to boot, to be considered only as a warning against the possibility of repetition.



covered, except for the portion of the fuselage below the stabilizer which is an integral part of the hull. Structures larger are well suited for dynamic balance. All control wires and cables are internal.

The two 750 hp Pratt & Whitney S4B-G Horizontally opposed three-bladed constant speed Hamilton-Standard controllable propellers are on vibration dampened welded steel axle mounts. The axles are well faired into wing and all supporting struts. The 3-3-1-1-1 controls are made up in sections to be easily removed for engine maintenance. Lines for exhaust stacks (stacks studied by Seder have been designed to fit smoothly into the general lines of the nacelle. Four fuel tanks are carried in the center section behind the engine mounts. Landing gear, spaced in forward behind the cabin, for valuable life with equipment, retracted through trap doors in the upper section just behind the fuselage.

The retracting landing gear is hydraulically operated. Welded steel axle legs, for each wheel are interchangeable right and left and are also easily removable for converting the amphibian to a flying boat. When retracted, the 45 in. circumference tires fit snugly into recesses in the ribs of the hull, leaving only the smooth outer hull of wheel and tire exposed. The 16 wheel weighs 260 lbs., uses an 800 in. low-pressure tire and is fitted with a hydraulic shock absorber. Brakes are hydraulically operated and are designed to be effective even when wet.

The general specifications for 5-43 are as follows: span, 56 ft 2 in.; height, 17 ft 8 in.; length overall, 32 ft 2 in.; total submerged displacement of hull, approximately 30 tons; wing area, 260 sq. ft.; gross weight, 99,000 lb.; weight empty, 11,260 lb.; model load, 7,400 lb.; power loading, 126.7 hp per sq. ft.; wing loading, 24.54 lb. per sq. ft.; cruising speed (on level 75 psi coast), 167 mph.; cruising speed (1,000 ft. 75 psi coast), 165 mph.; cruising speed (3,000 ft. 75 psi coast), 166 mph.; high speed (on level), 180 mph.; high speed (7,000 ft. 1,300 psi), cruising speed (on level), 65 mph.; high speed (on water 7,000 ft.), 125 mph.; stall rate of climb, feet per minute, 1,250 ft.

## Canadian Freighter

The Fairchild "Super 71" for service in the far North.

TO MEET A REQUIREMENT existing for a machine capable of carrying a payload of 1 ton or not less than 250 cubic ft. of cargo space under a stage of 600 miles at 120 mph. (on level), the Canadian Fairchild engineers have produced a new Super 71, a ship which externally at least, has little in common with a predecessor of the same designation. It is a high wing monoplane. (Canadian



An amphibian that can. Note retracting main winging mechanism and the general construction of the cabin floor. The lower face of center section spar is visible between the engine.

engineers feel that that type is generally more satisfactory for docking in from bays and for loading in deep snow), and it is adaptable to wheel, float, or land gear. Good such possibilities are one of the way, however, reminiscent to other Model 71s come.

Since No. 1 job in the service for which it was intended is the handling of incoming and well necessary down-loads for both the landing beaches and the cargo space were decided upon only after consultation with inspection men at each airport. The cabin floor is clear over 33 ft 6 in. long, and 8 ft wide. The miscellaneous loose equipment for the pilot seat (cabin, rope, operating gear, tools, etc.) are stored in compartments in the wing struts. Behind the cabin floor is the cargo. Interlocking braces is a device for dropping and high into the cabin when door is closed. Although the basic hull structure is metal, the cabin floor is all wood, first, because of its non-slip properties, second, because it can easily be replaced in event of damage.

Although primarily a cargo carrier, passenger seats may be fitted and provision has been made for cabin heating and ventilation and a certain amount of sound insulation. Operating in outside temperatures as low as 60 deg. below zero, the heating system is guaranteed to maintain a comfortable cabin temperature. Windows, set in spigots rubber and doors sealed on sponge rubber gaskets help to keep out cold when the door is shut.

Provision is made for one pilot and all of the cabin is an open cockpit with a removable streamline cowcatcher. Doors in the bulkhead lead into the cabin and cockpit and ample clearance supplied



Landing gear extended. Wheel rests on smooth take runs in hull leaving only smooth fair exposed to operation.

for the flying controls, however, while it is possible to use wheel jacks to take over while the machine is in flight.

The structure is of composite construction, the fuselage is all metal monocoque, wings wood-frame, fabric covered.

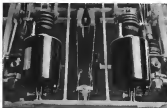
Although some operators favored all metal wings it was considered more desirable to retain the older type of structure to keep down costs of development and maintenance, and to simplify maintenance in the field. Two features of the wing are of note, the stress bracing system consisting of the short wing ribs (which at this stage have, provide points of attachment

(Continued on page 40)



Model "A" Stinson "Lo-Wing" Airliner

## BENDIX B-K POWER BRAKES



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**AND ECONOMY IN TEXACO AVIATION PRODUCTS**

for the several types of landing gear, also the various upward deflection of the center section as it passes over the landing (designed to give lower wheel-axle drag than either the bush type center section or the pull taring). On wheels also is the disposition of the fuselage and various high up on the fuselage again dictated by speed Canadian requirements as past experience has shown the desirability of raising the fuselage to prevent damage from flying spray on air or snow.

Although designed basically as a seaplane, this is not an easy feat. The land type undercarriage is equipped with extra long wheel shock struts which are indispensable for winter operations on bannocks.

Standard power plant is the Pratt & Whitney T151. Wing rated at 500 hp at sea level. Alternate engine is a Wasp supercharged to 500 hp at 7,000 ft which is estimated to boost the speed of the seaplane at that altitude to 118 mph. The engine is mounted on anti-vibration rubber loadings and the whole unit is made widely detachable in landing serving in the event of damage. Cowling is so arranged that the top, sides and rear of the engine are easily accessible. Unusual feature is the provision of a large inspection door in the fire wall by which access to the rear of the engine and its accessories can be obtained for inspection and servicing. Cowling air is taken from the top of the fuselage to eliminate the entry of more spray or sand. The exhaust manifold and its accessories are also easily accessible and land starting is provided. All electrical circuits except the lights in the cockpit are forward of the fire wall. A float probe pre-



The Canadair-built F4U-100 biplane is said to stand up to winds, brine or ice. (The wheels shown in the photograph are landing gear only.)

jector is standard equipment, but detachable propellers may be fitted if desired.

To control engine temperatures under the extreme operating range experienced in Canada, the power plant is completely housed in a cowling which permits the crankcase and cylinder head temperatures to be regulated independently from a dual shutter controlled from the cockpit. Additional temperature control is obtained from an oil cooler of generous capacity. All shutter and other engine controls pass from the cockpit to the engine through two ducts running along the outside of the top of the cabin.

The general specifications for this airplane include span 58 ft., length overall 30 ft. 6 in., wing area 362 sq ft., weight empty on wheels 3357 lb., on



also 4052 lb., on floats 4220 lb., alt. take-off 2700 ft., max. 7000 ft., wing loading 17.60 lb. per sq ft., power loading 13.43 lb. per hp. Performance, top speed at sea level 118 mph at 7000 ft., range on a seaplane 296 nautical miles, speed 36 mph, stall rate of climb at sea level 600 ft. per minute.

## Small Bimotor

New monoplane with two Siskel engines

NOTES: (See AVIATION, page 66) and the completion and flight testing of a small two-engine monoplane designed and built by H. A. Hamstead and George B. Fisher of Los Angeles. Available now are further details, aerial photographs.

The ship is arranged for two people seated side by side. Construction is conventional, the fuselage being of fabric covered steel tubing, the wings full cantilever, wood braced, plywood covered. Plans are under way, however.



The Fisher-Hamstead monoplane powered by two 40-hp Siskel engines.



From the rear, the Fisher-Hamstead monoplane resembles a second down sail-craft transport.

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Aces and spacers

### AIRWHEEL® EQUIPMENT

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Tubes regular and heavy duty  
Inner liners for increased puncture resistance  
Tailwheel casings  
—also tubes, hubs and self-contained bearing adjustment sleeves  
No brake type wheels  
Wheels with mechanical brake type brakes  
Wheels with Goodyear hydraulic disc type brakes  
Cantilever—braking master cylinders, hydraulic hose and special fittings for hydraulic lines  
Pneumatic motor valves

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for a complete armored ship, all-metal ship of the most general design. Special features include loading deck flap, elevator and rudder side, hydraulic shock absorber, (the landing gear is non-retractable), Armament (broken into approximately), main battery compartment. The cabin is fully equipped, partially unpowered, and enclosed in an alloy plate. An increasing draft is a large portion of the cabin roof which lifts automatically when the door opens.

Although the present power plant is a two 45-hp. Sulfurite, the ship has been designed to take a pair of 60-hp. engines. No arrangement of the new power plant has been made as yet but it is rumored that they will be in a jack-screw mounted in one type.

General specifications include: speed 34 ft. 8 in., overall length 20 ft. 6 in., wing section, N.A.C.A. 241.3 at the root, tapering to N.A.C.A. 241.2 at the tip, wing area (including 17 sq. ft. under the fuselage) 142 sq. ft., single engine (including fuel) 827 lb., gross weight 1,500 lb., wing loading 10.9 lb. per sq. ft., power loading (both engines) 17 lb. per horsepower (one engine) 24 lb. per horsepower. Performance: top speed 117 m.p.h., cruising 100 m.p.h., landing speed (flaps up) 53 m.p.h., (flaps down) 40 m.p.h., initial rate of climb 800 ft. per minute.

## Bomber on Flonto

The Army experiments with a Sea-going bomber for coast defense

AN ARMY GLANIER, a seaplane for the Air Corps meets several conditions, but when one considers that the de-



An Anson, which bomber aircraft on Lake Ontario in use of New York City's Seaford airplane range.

from thousands of miles of seaplane coastline and navigable rivers falls to the lot of the Army, the idea does not seem so far out of bounds. How the Martin E-10 bomber performs as a seaplane and what its ultimate design lines have not yet been disclosed, but a glimpse of what it looks like was afforded when the experimental ship was loaded in the East River recently and pulled high and dry on Commander Zeller's floating ramp at E. 31st Street.

The accompanying photograph, taken on that occasion, shows a few of its details close-up. The two Model 19790 Ede floats with their standard water rudder equipment are attached side-

proximately to the wings. No cross-bracing interferes with bomb dropping from the belly compartment. Bombings practiced on the sides of the floats indicate that each contains an auxiliary fuel tank.

The ease and the speed with which the big bomber was taken out of the water on the floating ramp suggests the value of such equipment for military purposes. It took very little imagination to see how, by simply widening out the gangway connecting the float with the pier, a track might have been driven alongside the ship (it was actually under the fuselage) from which a fresh bomb load could be quickly transferred.

## With Foreign Builders

A group of airplanes of widely varying types from overseas factories

Swiss literature labels an elaborate treatment of every airplane at note that appears abroad. In the following paragraphs, however, will be found detailed descriptions of a few new types, a brief resume of other noteworthy machines produced in foreign factories during the past few months.

### Great Britain

An intricate combination of subsonic and supersonic in the Carbin Duxton "Aurora" airplane. A single cylinder air-cooled engine, driving a two-bladed propeller fitted in a pod in provided in a means of actuating the airplane off the ground and of putting the aircraft

any desired height the engine may be stopped and the whole power plant retracted into the fuselage. The engine delivers only 55 hp. Total weight of the machine complete with engine, pilot and fuel is just under 300 lb. With engine retracted, the characteristics are those of the lightest airplane. "The speed is 450 ft. per hour, aspect ratio 30 to 1."

The B.A.M. has announced a new Swedish proposal with a 75 to 85 hp. Polaris engine. This machine is a light tandem two-place low-wing monoplane. Involving the well-known German Klemm formula.

General Aviation, Ltd., has announced a new two-seater monoplane for early July test flying. Intending to American readers is the addition of two 400 hp. Wasp Jr. engines in power plants. The ship carries a crew of two and two passengers. General aviation shows similarity to the Stinson Model A. Airtour with some engine modifications.

In the military field, the Air Ministry has placed orders for a special Model 625 Avia trainer, two-place open cockpit biplane, powered with the Spideley engine. These machines are destined for navigation instruction and are fitted with special instruments, etc. For coastal defense, a very fast two-engine Avia 602 has been converted to military purposes from its ordinary commercial form. It carries two 200 hp. Spideley Cirrus VI engines and with a crew of three it is reported to do some 170 m.p.h.

A recently announced British military machine is the Blenheim Page general purpose reconnaissance, a two-place open cockpit, low-wing machine, distinguished chiefly by sharp reduction in drag—zero-drag immediately behind the observer's cockpit, with tail surfaces carried on a small fuselage house. This ship carries a full complement of 12 ft. 2 in. projectiles, including a combination of slats,

# "Gulf Aviation Gas ALWAYS DELIVERS WHEN I NEED IT"



With an 8 cylinder engine, the Gulf Aviation biplane, built by Gulf Aviation, Inc., is a real gas. It has a track record of 100,000 miles in 10 years.



Chief Pilot Baker, who has the low percentage of accidents in the Gulf Aviation biplane, is a real gas. It has a track record of 100,000 miles in 10 years.

*Says R. L. "Bud" Baker*  
CHIEF PILOT, PENNSYLVANIA AIRLINES

"A pilot likes to have both in his plane, his weather information, his radio, and his fuel," says Chief Pilot R. L. "Bud" Baker, of Pennsylvania Airlines. "I've been flying the route over the Alleghenies from the Capital to the lake for eight years, and I get a comfortable feeling out of the use of Gulf Aviation Gasoline. My tank has never been shaken in the ability of this fuel to deliver when I need it."

Other pilots agree. The reason is Gulf Aviation Gasoline is superior under the best crude oils. It meets every specification of the U. S. Army and Navy.



According to R.L. Baker, Gulf Aviation biplane is a real gas, even in the winter.



Pennsylvania Airlines, pilot who delivers fuel that is a real gas, even in the winter.

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spheres and flaps with spinning tabs on all control surfaces. Constructive security of metal. Blackburn has also announced a new G.P. machine, a two-place open cockpit biplane powered with the Shilden Tiger engine. The machine is virtually a monoplane. The replacement shows one of the W Type similar to those used on many British military biplanes. The biplane has a smooth metal skin. The undercarriage is of the light axle type to afford clearance for torpedo carrying.

#### France

By a relatively simple process of transformation, the "biplace de combat" Potez 54 will soon appear on the routes of Air France as the twin-engine Potez 62. The first model has recently been undergoing flight trials at Villacoublay.

The large rectangular fuselage offers comfortable accommodations for four-ton passengers. Characteristic Potez wingtip construction is used with fuselage in wood, metal-framed wings with fabric covering. Landing wheels retract into the engine nacelles. A full complement of armaments and accessories for aerial service has been installed. The two engines are Gnome and Rhône 14 Kappa, direct drive, each rated at 870 hp at sea level at 2400 r.p.m.

General characteristics are: span, 75 ft. 2 in.; length overall, 50 ft. 8 in.; wing area, 518 sq. ft.; weight empty, 8,800 lb.; gross weight, 15,500 lb.; cruising speed, 174 m.p.h.; cruising speed (on one engine) 180 m.p.h.; ceiling (normal), 20,000 ft.; ceiling (one engine), 14,000 ft.

Although French design interest recently has centered around the Caudron which participated in this year's Coupe Deutsch (see p. 19) several new commercial and military types have appeared. The Caudron-Somua "Gondol" eight-place twin port follows the familiar low-wing, two-engine, plus retracting gear formula. The engine are of the 6-cylinder inverted-in-line type. Interest in "Pouchet-Curt" seems to continue unabated. A large number of three-engine model planes appear to be under construction, if not in actual use. We hope



A German advanced biplane, the Arado Ar.60

to comment more fully on this phenomenon in a later issue.

On the military side, the Messerschmitt 189 C2 has been undergoing flight trials. This two-place, interceptor fighter has full wings, as fitted with the latest 200-hp. power Daimler-Benz engine. Various tail sections are fitted on the tips of the horizontal stabilizer to give increased field of fire for the observer's machine guns.

#### Germany

In view of recent developments in Germany, the appearance of such ships as the Arado Ar.25, high performance single-seater, has more than mere sporting significance. Obviously this ship has characteristics which fit it ideally as an advanced military trainer. It is a conventional parasol type steel-tubed monoplane of normal structure. Unusual structure has been paid, however, to make the component parts extremely rugged, easily accessible and replaceable. The landing gear has been constructed to simplify the main wheels being carried on a pair of "box-legged" struts without any external bracing whatever. The tail assembly is unique in that the fin has been pushed ahead of the stabilizer. The latter is fixed, longitudinal trim being obtained from a small trailing edge flap on the one-piece elevator.

The engine is an inverted eight-cylinder air-cooled unit, the Argus As 10C of 240 hp. It is hung on the

boom at four points. The engine assembly is removable in a unit for replacement. The landing gear, drawn out, is easily removable for maintenance. A single air scoop is below the propeller between the legs, with air ducts to the rear of the engine nacelle. General specifications include: span 30 ft. 6 in.; length overall 25 ft. 6 in.; wing area 143 sq. ft.; weight empty 1,550 lb.; gross weight 2,180 lb.; top speed 167 m.p.h.; landing speed 62 m.p.h.; climb to 2,500 ft. in 2 minutes 30 seconds; service ceiling 21,000 ft.

Germany's efforts so far as they have been published, have included a number of high performance trainers, similar to the Arado described above. Another typical example of such a ship is the Pöschel-Wall single-seat trainer, powered with the Argus As 10 Series C inverted air-cooled engine. Externally back to the main specifications, its appearance is very similar to the Arado. Auxiliary engines are also popular in Germany. Outstanding example is the Heinkel "Haken-Coupler" which appears to be a recent type of airplane with a small 3-cylinder air-cooled motor mounted to a pusher in a horizontal position above the main engine. The power plant is not retractable as in the case of the British auxiliary airplane described above.

#### The Netherlands

The Polder P-XXXVI designed with the ultimate purpose of use on the South Atlantic crossing, takes rank



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N O R T H R O P



Polder P-XXXVI for Air France

among the world's largest transports. It is designed for a gross weight of 25,100 lb., including 22 passengers, a crew of four, and a baggage and mail load of 15,000 lb. Four Pratt and Whitney Wasp of 525 hp. each furnish the power.

Another addition to the rapidly growing list of two-engine transports comes from Holland in the Koolhoven Avianer, a machine lately purchased by R. L. M. for feeder service. Normally designed for two pilots and six passengers, it may be equipped for short flights for one pilot and nine passengers, or fitted as a cargo carrier with one pilot and one radio operator with cargo turned into cargo space for mail or freight.

Fuselage is fabric-covered over a welded steel frame. For passenger carrying work, steel seats are moulded and the cabin is equipped with adequate heating and ventilating systems. The wing is constructed entirely of wood. It is of the two spar type, the spars being of spruce and plywood and the covering entirely of plywood. All fittings are easily accessible for inspection. The tail surfaces are made of steel tubes with sheet steel ribs, fabric covered. Fuselage

stabilizers are fixed, twin boom attached to tail leading edge flaps in elevator and rudder.

The power plants are two direct drive Gypsy Majors, each with an output of 124 hp. at sea level at 2,350 r.p.m. Either fixed or controllable pitch propellers may be specified, considerable improvement in performance being obtained from the latter.

The general characteristics are: span, 49 ft. 10 in.; length overall, 36 ft. 8 in.;

empty weight, 2,640 lb.; gross weight, 4,940 lb.; top speed at sea level, 120 m.p.h.; cruising speed, 118 m.p.h.; service ceiling, 13,000 ft.

#### Italy

For one reason or another, not one of the large, single-engine low-wing monoplanes produced for the McRobertson Trophy race made any sort of showing. Except for the American-built Q.E.D. none got even as far as the starting line.



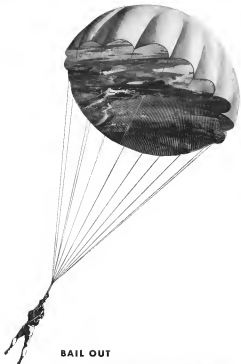
The Fiat 8, built by Fiat for the McRobertson Race.



The Fokker P-XXV.



Koolhoven Avianer for feeder service on R. L. M.



## BAIL OUT

A chute is still only the "second best" way of getting down. Few pilots choose to bail out so long as there is a chance of landing the ship. Why choose "second best" gasoline when you can have Ethyl's dependable power? Ethyl Gasoline Corporation, New York City.





Bellevue's Bush Seaplane was duplicated and Harter's ship crashed during trials in France. Help also produced a contender of the same general type, the PL-4 by Curtiss Aeromarine Design, but delays in obtaining the necessary design approvals kept this machine out of the race.

Eventually, PL-3 seems to derive more from American practice than European. Power plant is a Pratt & Whitney Hornet fitted with a Hamilton-Standard controllable propeller. As far as we know, it is the first commercially built motorboat anywhere to make use of trailing edge flaps on a full NACA cowi to control engine cooling under various flight conditions, an idea developed by Pratt & Whitney engineers and successfully built down on an experimental ship at Hartford last summer (Aeronautics Mar. 1934).

The fuselage is of circular cross-section wider in the tail, and is large enough to displace it at the cockpit to permit side-by-side seating for the two pilots. Composite construction is evident throughout. Framework is of chrome-molybdenum alloy; metal and plywood are used for covering forward of the cockpit, fabric aft. Wings and tail sections are of felt reinforced with wooden spars and a combination of pin and oval fabric covering. Trailing edge flaps of the upper type are included. The landing gear extends in rearing the fuselage backward into recessed fairings two wing spars. Retractors are hydraulic, actuated by hand pump in the cockpit between the two pilots. Low pressure wheels with hydraulic brakes are fitted. Fuel and oil tanks are in the fuselage ahead of the cockpit.

The general specifications indicate: length 26 ft., height overall 20 ft. 6 in.; gross weight 2350 lb.; weight empty 1270 lb.; gross weight 2300 lb.; speed (at 11,600 ft.) 224 m.p.h.; range (full load) 1,360 miles.

Italy's latest transport, the Fiat G-38 as 18-passenger monoplane, cruising at 335 m.p.h., is the Douglas formula all

over again. Engines are two Fiat ASHR geared and supercharged, rated 500 hp at 2150 ft. and 6500 ft. Airspeed, 300 m.p.h. on Pratt & Whitney Hornet with under license. Two Hamilton-Standard controllable propellers are fitted. Basic structural material is duralumin.

#### Painted and Corrosion-resistant

The Polish National Aeronautics Factory has turned out the PZL-37, a fast combat monoplane fitted with three 136 hp Gnome Mays. The two outboard power plants are suspended from the

wing in streamlined nacelles, and landing gear retracts into the nacelles. As the wing is of the full cantilever type and no aileron bracing is employed in the extreme, the machine is unusually stiff with wheels up.

From Czechoslovakia comes report of a new steering plane, the Loh, designed and built by Josef J. Lohak. A low-wing, monoplane of good aerodynamic form, with covered cockpit for three people, it has a reported top speed of about 125 m.p.h. on a 5-cylinder Walter engine of 60 hp.

## Operator's Corner

*An exchange of ideas on the problems of the commercial aviation industry*

**QUESTIONS:** I do not consider it necessary for an operator to cover much more than "What other forms of insurance do you consider essential? Have you found it possible to schedule flights, complete coverage and still have operating costs at a reasonable figure? What proportion of your operating cost goes into such things as insurance? Underwritten by A. Edgar Kim, 1015 Connecticut, Washington, D.C.; 2200 Vermont Corporation, Seattle, Wash.

#### Ten Per Cent of Operating Cost

**CRASH** insurance is so expensive at present that we prefer to carry our own, and just a dollar an hour over the such an emergency, suffer the loss if it is in the insurance company. We do carry fire, theft, and war-risk insurance which covers those items over which we have no control. In this way we spend less than 20 per cent of our actual operating cost for insurance—R. L. Nair, President, National American, East St. Louis, Ill.

#### Cheaper to Run a Ship

**WHILE** crash insurance is expensive, with a most desirable form of protection for the single commercial operator this insurance is so high priced that it does not pay an operator to carry it. To begin with all crash policies are written on a deductable basis and the deductable amount plus the cost of the premium is sufficient to take care of virtually any crash with the exception of a complete washout. Such washouts are infrequently events to justify the operators in taking such risk in the majority of cases. In the case of our own operation in which several airplanes are insured we feel that the above reasoning when applied to our several aircraft is ap-

ply correct. In other words the cost that we would pay for having all of our ships insured for crash would be considerably more than we would have to pay if any of these airplanes was completely washed out.

We consider it essential to carry fire and war-risk insurance as we realize that we are completely vulnerable to an unexpected fire or sabotage—Wynne W. Kason, President, St. Louis Flying Service, St. Louis, Mo.

#### Build a Reserve Fund

**ALTHOUGH** crash insurance is something every operator should carry, present costs are prohibitive. In place of carrying insurance we have set up a reserve fund to take care of emergency repairs and replacements. We plate aside 50 cents for each hour flown and take the sum for no other purpose than those of an emergency nature. Under this arrangement the operator has to provide for the first few hundred hours' operation but as time goes on and the reserve is built up, a loss is not such a financial problem. At the present time our reserve equals approximately 25 per cent of the value represented in our flying equipment—Joe Dunson, Grand Central Flying School, Glendale, Cal.

#### Insurance for Large Operators

**IN any** sort of an extensive operation wherein it is impossible for the contractor to know the habits and character of each student we consider it impossible to carry crash, public liability and pilot insurance. We have not found it possible to compete with the same prices on smaller flights in the same type of equipment, but try and overcome the

## VERSATILITY

Vought Corsairs operate with equal facility from land, water, carrier deck, or catapult. For more than 15 years they have played an ever-increasing part in the observation, bombing, and scouting aircraft activities of the U. S. Navy and U. S. Marine.

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U. S. Marine Corps  
U. S. Navy  
U. S. Army  
U. S. Coast Guard  
U. S. Marine Corps



Office Photo ref. G. S. 35-7



Close-up of Pratt & Whitney engine installation showing trailing edge flaps in the landing gear cooling flaps.

with a more thorough plan of instruction, emphatically not stressing the idea of saving as soon as possible but laying emphasis on producing a more competent pilot when the training period is completed. About 15 per cent of our operating cost per side goes for insurance—B. H. CAMPBELL, Chief Pilot, United Air Service, Ltd., Burbank, Cal.

#### Student Damage Negligible

WE do not carry crash insurance. Our attitude is each pilot assumes of his type is too costly and we have found from experience that we can operate cheaper by not carrying insurance and including any crashes involved in the past it has proven the element by a very large margin. Over the period of three years our damage to planes has not come up as much to repair as our pilot's personnel on mission. Five percent for the longer is carried of course, but we consider that not directly related to plane operation, but purely protection for the content of the bodies—Ferry W. Wayne, President and General Manager, Monmouth Airways Corporation, Rumson, N.J.

#### Sell Insurers for Cash

WE carry all forms of insurance except crash, and for that we have provided our own coverage by selling inside a specific portion of each dollar of operating revenue to enable a fund to be used in the event of crashes which are almost insured of where proper management and sound policies are followed. We have found coverage for fire, theft, vandalism, public liability, flood and property damage can be carried without unduly increase operating expense—HAROLD T. ACOB, President, Price Sales of New York, Inc., Astoria Park, L. I., N. Y.

#### 117 per cent of operating cost

THE National Flying School of Holland in the early years assumed the main risk in flying with their aircraft. Now that business is rapidly improving the fleet is covered in full for ground risk, flying risk, and that party responsible. The ground and the excess assumed is 117 per cent of the operating costs per hour—M. J. L. ROSSAUX, Secretary National Flying School, Rotterdam, Netherlands.

#### Not for small operators

WE feel that for the small operator with less than six pilots and five planes, it is not profitable to carry such insurance. Although we admit the safety of doing so, the fact that reduced insurance rates cannot be obtained on less than five planes makes the burden

of crash insurance too great for the smaller operator—H. A. AASE, manager, Persepolis Flying Service, Inc., Norfolk 20, Va.



QUESTION 4. How many losses do you assume a student is liable before insurance takes? What is the method of payment? Does he receive a rebate on the fee he pays when the loss is paid? (Submitted by R. E. HENNINGSEN, New York Air Service.)

#### Fuel Credit Cards Used

WE do not encourage cross-country flying today, a student has at least an additional pilot's license. Individuals who have demonstrated exceptional flying ability, and who are older and more mature, are judged. Some the average are allowed to fly cross-country occasionally while still flying on a student permit.

We encourage cross-country flying for those who have a private pilot's license, but the decision as to who can fly cross-country is based on the pilot's previous experience and flying record. On the first cross-country flight we strictly arrange for another pilot, who has already made the trip, to accompany the beginner. Sometimes two students will share the expense of a plane on a cross-country flight. Gasoline credit cards are supplied on planes and students are charged directly to the card.

Cross-country flying is encouraged for those who can qualify for it because it instills a student to pay side practice the knowledge he learned of ground school in meteorology and navigation.

#### Question 3

Answered by your members at present. When the first instructor, often referred to as the master, is in a position to make his own decisions for his own school, he is in a position to make his own decisions. The one who is in a position to make his own decisions is the one who is in a position to make his own decisions. (Submitted by M. J. L. ROSSAUX, National Flying School, Rotterdam, Netherlands.)

#### Question 2

Answered by your members at present. How have you solved the ground school problem in your country? There are many methods for solving this problem. Some use a ground school, some use a ground school, some use a ground school. (Submitted by M. J. L. ROSSAUX, National Flying School, Rotterdam, Netherlands.)

Also, however, it is important to be used for more than flying in circles around an airport, we are not using aviation to the extent that it is capable of being used. The airplane is fundamentally a means of fast transportation and we believe that those who are qualified should use the plane in such whenever possible—A. HANSEN, Manager, President, Washington Airways, Inc., Washington, D.C., Seattle, Wash.

#### Two with the instructor along

AS SOON as a pupil is licensed, he must perform two cross-country flights with an instructor, whereby these flights can be made on a single day. After that the pilot is allowed to make cross-country trips alone, subject to approval of the instructor who has made flights on our machines for a period of the time before, but these instruments are not always reliable. The school from which I have been licensed, pays for fuel tanked on the trip—J. L. ROSSAUX, Secretary, National Flying School, Rotterdam, Netherlands.



QUESTION 5. Do you consider it advisable to maintain your ground school to continue being kept fresh? Anticipate answers to this question were published in May last issue.

#### Depending on the weather

UNTIL 1954 the flying instructors of the National Flying School of Holland (National Flying School of Holland) gave ground school instruction without extra payment. With the increase in the number of pupils, the instruction of the ground school and the instruction approved. Now we are operating continuously at the rate, so that time can be spent for theoretical instruction only if weather prevents flying. This method is used to promote theoretical courses to be given in the navigation school at reasonable rates, which proved to be successful. We are convinced that it is worth while to make people in general more interested by these means, as the more people know about aviation, the more they feel inclined to learn flying. The Government in Holland gives the opportunity to me and three young men each year to be trained up to pilot of the commercial line (K.L.M.) in a fixed-term period. These students for the first 4 flying hours is instructed to the National Flying School, whose theoretical instruction is given by the National Flying School and the Navigation School at Amsterdam. After this period the pupils are transferred to more powerful aircraft of the K.L.M. in order to get their B license—M. J. L. ROSSAUX, Secretary, National Flying School, Rotterdam, Netherlands.

KONINKLIJKE LUCHTMACHT MONTAGEFABRIEK VOOR NEDERLAND EN KOLONIEËN NV  
US VAN DE VERBODEN, 80 VERBODEN

ROTERDAM, JUL 1955

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## Propeller Pliers

TO BE added to the list of simple little gadgets that save time and money for repair departments is a special pair of pliers noted at United Air Lines' propeller maintenance shop at Chicago. They were designed to simplify the removal and installation of built-up assemblies in the counterweights of Island two-bladed controllable propellers. The clearance around the adjusting screws is so small that it is awkward to get them out with the fingers or with ordinary tools. By using the special pliers, with narrow beveled and flared to fit snugly around the bolt, the job can be done very easily and without danger of dropping the assembly or damaging the device.



Removing built-up assemblies from counterweights of the propeller is simplified by a special pair of pliers used by United at Chicago.

## A Place for Everything

IN last month's *Stuntmaster Notebook* we commented as a special bench for a "Wall" being fixture as an example of the general sort of good housekeeping to be found in the engine overhaul shops of Aviation Industries, Inc., at the Grand Central Airport, Los Angeles. Further evidence may be found in another picture showing the true clean and organized departments of the same shop.



Mid-stage shop. Typical arrangement of tools and equipment in the engine overhaul shop of Aviation Industries, Inc., Glendale, Cal.

On a dipping pool behind the bench which runs the full length of the shop along the windows is a definite place for every single tool and instrument required. Large tools and small tools have their own shelf, bracket or holder within reach of anyone at work at the bench. No tool can be missing without its absence being instantly noticeable.

The idea of having a board for large tools is not new, of course, for almost

## Hanger Spotlight

TO GET properly placed light for inspection or repair in parts on the underside of wings or engine nacelles on the Copter ships, Pan American's shops at Miami use portable units of the type shown in an accompanying picture. Ordinary floodlights are satisfactory on account of the darkness of the illumination must be directed, and the long lengths of electrical cord that would be needed to take portable extension lamps to the job would be awkward or in some cases, dangerous. The spotlight shows a highly concentrated beam which can be easily directed to any desired part of the ship from a long distance. For the lamp is suspended by a long, swiveling indicator. As the whole unit is about 5 ft. high and comparatively light, it can be easily placed as required and is connected in cable to some convenient electrical outlet with a relatively short length of cable.



Spotlight used in Pan American's shop plane service at Miami.



## IN THE AIR AND ON THE GROUND



**DEPENDABLE** flight demands dependable engine performance. Dependable loadings, accurate dependable landing wheels. Timken Bearings are important factors of both in all types of modern airplanes.

**Timken Rocker Arm Bearings** assure smooth, frictionless rocker arm operation; hold rocker arms in correct and constant alignment; prevent lateral wear and loosening; and preserve accurate valve action. Adequate lubrication is assured under all operating conditions.

**Timken-Equipped Landing and Tail Wheels** roll smoothly and steadily at any landing speed; exert "vibration" reduce ground-looping tendencies; possess maximum strength and shock-resistance; require very little attention for lubrication and maintenance. They are standard equipment on all the leading makes of airplanes—large and small.

It will pay you to specify these modern refinements when buying airplane equipment of any type.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO



# TIMKEN TAPERED ROLLER BEARINGS

## News of the Month

### Pacific Rehearsal—Act II

The Pan American Clipper tests the route to Midway, North Haven on back track from Manila.

Means to an end? The purpose at the sport with which it's operations over a new and different route beyond accepted in consequence by the public and its press. Last April the flight of the Pan American Clipper to Honolulu occurred from great headlines; it had a loaded table of contributions from public officials. Last month Pan American Airways were therefore flattered by having the Clipper's second flight released to page ten of the New York Times by having the day printed at Pearl Harbor by a very leading crew, a few personal friends of the firm, and some Department of Agriculture plant inspectors after continued flight.

**Algebra** . . . Bureau of Air Commerce applies for \$35,750,000 of relief funds for a coordinated airport development fund. . . Two of five scheduled rapid Airport Construction held under auspices of Chamber of Commerce.

**Army and Navy** . . . Bureau of General Posters at Air Corps Chief advised by Secretary Bess. . . July show at Randolph residents 163 . . . Wilson Airline bill passed House . . . Navy Equipped aircraft intensive exercises at maximum close . . . First group of radio state training.

**Foreign** . . . Clipper made return from Honolulu after two years . . . England's Ensign Air Star.

**Financial** . . . Airlines Corporation collapses new shares for all . . . Quarterly Report for United Airlines and West Atlantic.

**Industrial** . . . Bellows transportation . . . Radio aviation transportation . . . New light plane by Avedis Arzoum flight tests.

Notes and Incidents: Never in all 8,000 miles was the ship without constant radio control from two or more stations. Once, when a danger of 20 miles was made west of Honolulu, the ship was in Honolulu, Honolulu, and Midway notified them of the danger almost simultaneously. Nor was there a reply at any time with the Post and Western power plant with its automatic alarm control. Fuel for more 800 miles remained on the tanks after the westward leg from California.

Honolulu the urgent construction expedition on the North Haven has kept remarkably close to the schedule set for it months ago by the company's engineers. Radio stations are at Hawaii, Midway, and Wake. Midway is completely ready for full operations. Wake soon will be. Supplies have been laid at Guam and Manila. No development seemed possible last month which might delay the return of the ship to the mainland by mid-Aug. 1.

At home the difficulties between Pan American and the Post Office Department entered a second phase as Postmaster Tully submitted a report to the President advising that contracts for carrying mail by Latin America had been awarded the company after bid-ding periods sufficient to permit full competition. Classification, however, of an aerial mail route, the Postmaster stated, because of the disruption of service and injury to trade relations. Meanwhile two Post Office officials have been dispatched to study the Latin American network, to recommend modifications of schedules and services, thus providing reduction of pressure up to the Pacific.

Even more directly vital to the Pacific project was the House passage of a deficiency appropriation "For the transportation of mail by air mail by air mail across the Pacific" fiscal year 1934, \$1,000,000, to be expended under a contract or contracts which will set out a round-trip schedule for the fiscal year 1934, to be set out under fiscal year 1934 in excess of \$1,000,000."

## Sky Chief Report

Secretary Rogers criticizes forecasts and dispatching

ON JUNE 16, the Department of Commerce made public its findings on the fatal crash May 6 of the TWA air-bus near Atlanta, Ga. Summarizing 567 pages of testimony, the report had an embryonic cause of the accident.

(1) A faulty forecast by the Weather Bureau which failed to predict the hazardous conditions; (2) distance of the plane from Albuquerque, although the dispatcher had knowledge that the plane's radio transmitter was not functioning properly; (3) failure of the Albuquerque ground crew to call the plane back, or to estimate it to land at an intermediate point when it landed it could not establish two-way communications; (4) failure of the pilot to land once in practicable time learning of failure of his radio; (5) failure of the Kansas City ground personnel to re-dispatch the plane earlier when conditions became increasingly hazardous at that airport. It further found that the exact cause of the crash was an unconfessed violation of one wing with the ground when the plane was at-

tempting a turn at extremely low altitude, that had the only 27 minutes of flight remained in the tank.

Immediately following the issuance of the report, Line President Frye said in a statement "Transcontinental & Western Air officials were sincerely disappointed definitely established the fact that the real cause of the accident was that Pilot Bottom, when he moved the field at Kirksville, attempted to come down through a ceiling reported by the Bureau of Air Commerce observer at Kirksville as 7,000 ft. with 4-mile visibility and lower scattered clouds at 1,200 ft. What he actually found was a zero condition."

Next day came the Weather Bureau's side of the case. Said Dr. Gregg, Bureau chief, "The weather bureau for the Albuquerque-Kansas City Airway issued about seven hours before the TWA air-bus crashed . . . was followed by regular hourly reports, which showed rapidly changing conditions . . . If the pilot received that the accident should have been prevented. The Weather Bureau does not claim that its forecasts inevitably cause this. It is true that more observation stations would provide additional protection . . . (but) the network of airports including those

from Kirksville . . . have been carefully checked. There is no evidence of any appreciable inaccuracy in these."

By the end of the month the Senate committee to investigate the accident, Senator Capwell chairman, was holding its first hearings.

## Cancellation Suits

Former air mail contractors file claims under emergency law

ON ONE of the features of last spring's air mail contract cancellation were some suits filed by the contractors that their lack of redress through legal action, since the government could be sued neither in contract, nor in tort, were brought in the courts against Postmaster General Farley. It is true, but without exception they were denied and the denial supported at all stages of appeal on the grounds that the cancellation was Mr. Farley's action as an agent of the government and as an individual. Finally the June 15 Air Mail Bill (Section 6) apparently gave the necessary permission to sue the government. The section stipulated that suits must be filed in the Court of Claims within a year.

By the results of last month all operators of cancelled contracts had entered suit, were expecting action some time this fall. Specific amounts sought: United (group) \$1,014,555; TWA \$2,684,282; Eastern Air \$2,066,767; American \$5,167,344; National Parks \$257,934; Transwestern \$604,727; Northwest \$341,000.

## One Airport Fund?

The Department of Commerce asks for a lot of money

EVER SINCE the beginnings of national projects, the country's airports have been receiving assistance directly from local and state authorities. The drawing, grading, installing, and surfacing of an airport's runways are ideal subjects for the formation set forth in most specifications for federal approval, so well that projects should be primarily of government public value conforming as far as possible with established industry, and call for a high rate of labor expenditure to material cost. Fitting the airport, in brief, is a matter that a better number of men can do with shovels. Certainly it would be safe to guess that at least two thirds of the existing airports have been worked on by local forces, and scores of new ones have been built or started.

Early in June the Department of Commerce announced that it had applied for \$25,725,000 to be spent on its airport program. Features: (1) Completion of airport projects started under the CWA and other relief authorities, provided the land is suitably owned; (2) Modernization of existing non-federal air-



THE POST OFFICE ROOF

At Kirksville was said late in May by a dissemination delivery of mail by Ray Levy riding a Kirtley machine accompanied by the Ray in a Pioneer. Postmaster General Farley was present to meet the postmen, covered great success.



GRUMMAN AIRCRAFT ENGINEERING CORPORATION

FARMINGDALE

LONG ISLAND

NEW YORK

ports. (3) Establishing of new airports in cities of 10,000 or over, or in locations available to new or main, smaller communities. (4) Construction of airport ramps and facilities wherever practicable. (5) Preparation for blind landing apparatus and removal of general obstacles. (6) A wide program of air marking.

## Airport Conferences

Operators of fields and flying services meet with A. C. of C.

EACH YEAR the Aero Chamber has invited all those interested in airport problems to confer with them in some more or less centralized city. Such an arrangement always works handily on that whose operations lie farthest from the airport, in bringing the conference to the operator in the reported meetings at Washington, D. C., Boston, Detroit, San Francisco, and Minneapolis. The results of these meetings have been held, others are scheduled about a month apart. (See Calendar, Page 70.)

Consistently the chamber is making an invitation to field base operators to attend the conference, signify their degree of interest in membership in a

proposed division to assume the functions of the new inactive Independent Airports Operators. The meetings are conducted by Towle W. Barker, secretary, National Airports Committee A. C. of C. and Louis Inwood, formerly secretary I. A. O., now associated with the Aero Chamber.

Most discussed items of the extensive agenda for airports are: Uniform traffic control and regulation of activities at airports; local and state airport planning; most effective use of available relief funds. For field base operators, approval school significant; language instruction, proposed aviation classification of licensed mechanics.

Periodic at the Washington meeting was Howard M. Shafter of Rochester Airport. Conferees included Capt. J. H. Whitbeck (Minneapolis), Claude F. King (Cleveland), Carl Stranden (Hanko), Samuel Coleman, Col. John S. Wyman, Paul D. Mayers, L. C. Simpson, Joseph Shumate, William Boylen, J. S. Roselle (Washington), Edward Cole (Springfield), Charles L. Morris, M. O. Wamsley (Hartford), Capt. Albert L. Edson (Boston), Capt. C. W. Bassett (Detroit), R. E. Polton (Albany), H. H. Bailey (Pittsburgh), Edward Whitcomb (Alaska), L. M. Blawie (Baltimore), Richard Aldworth (Newark), Thomas Walsh (Grand Rapids), Floyd Ryan (Lansing).

Chairman of the Boston meeting was Manager Albert L. Edson of East Boston Airport. Present were: July G. Ross, J. Gerstle (Norwood); Clarence E. Hodges, Chester F. Bailey, Capt. W.



**FLYWEIGHT CHAMPIONS**  
The flight technique of Earl Winkler is shown in this photo. Winkler is the man in the flight suit, standing next to his plane. Winkler is the man in the flight suit, standing next to his plane. Winkler is the man in the flight suit, standing next to his plane.

## Calendar

June 25-July 16—Events cannot meet  
top of Boeing factory of America,  
Boeing, S. Y.

July 10-11—National Air Show, Detroit  
Detroit Airport, Detroit,  
Mich.

Aug. 1-10—Western National Air  
Show, Santa Monica, Cal.

Aug. 10-11—National Aviation Exposition,  
Detroit, Michigan Airport,  
Detroit, Mich.

Aug. 10-11—National Air Show,  
Cleveland, Ohio.

Andrewell, May E. Swanson, M. D. Smith, Charles W. Sutherland (Boston), Mr. & Mrs. Henry E. King (Tampa), Robert C. Colman (Pittsburgh), M. F. Kury, M. H. Rache (Covington), Lela E. Halstead (Pittsburgh), M. N. Coughlin, M. R. Hillard (New Hampshire), M. E. Morris (Quincy), Herbert Nolan (North Andover), Robert M. Lewis, A. P. Peterson (Tulsa), Arthur Ransdell (Lewistown), Carl L. Smiley (Savannah), Stephen S. Hanks (Manchester by the Sea), Don P. Wilson (Woburn), L. J. N. Y., L. S. Tate (Montpelier), Omer L. Morris, George P. Kane, Frank Heidrich, Titus P. Monahan (Hartford), Donald L. Gray (Westwood), C. Henry Haskins, Jr. (Gardner), Louis Inwood, F. W. Barker (Washington), Lela E. Neville (Aurora).

## Mail, Passengers, Express

Domestic airlines report more schedules, more speed, more facilities, more traffic.

Two systems had made assumed changes in their meteorological regulations but get their deficiency on an interim analysis basis. AMERICAN AIRLINES weather forecasters will hangfire under the direction of Dr. Irving P. Cook of the California Institute of Technology, one of the leading proponents of the Norwegian theory in this country, and will include Dr. George F. Shaver, W. C. Kockert, R. D. Fischer, Kenneth A. Willard, all graduates from the Caltech's meteorological course. American's weather headquarters will be in Chicago.

Extreme Alaska's meteorological unit is headed by Joseph George directly assisted by Benjamin Holman and William Warren. George organized the present weather service of Western Air Express in 1926. Holman is a Caltech graduate, Warren a former naval officer. Their head office will be in Washington.

LAST FALL DUNSTON AIRWAYS placed an order for seven West-coast Lockheed Electras. Five of these were scheduled for delivery last month. Waiting no time, in getting their new equipment to run, the system announced express changes in its entire schedule. An entirely new six-hour service from Chicago to Renoville is listed. A new direct route between Cleveland and Corpus Christi has been added. Connections with other airlines have been improved in numerous instances.

A reorganization of HAWAIIAN AIRLINES was announced late in May coincident with the assumption of passenger service. The new board of directors is headed by A. S. Macdonald, Sr., as president; Paul G. Brice, executive vice-president and general manager; A. L. Rudman, treasurer; Mrs. Edna Macdonald Kelly, secretary; and L. H. Knightley, controller.

NATIONAL AIRWAYS, operator of the



## DEDICATED TO THE NATION'S AIR POWER

An aerial preview of Consolidated Aircraft Corporation's new factory on Lindbergh Field at San Diego, California, where air land and sea-water combine to afford the ideal location for efficient production.

Consisting of the most modern airplane plant in the world, with 20,000 square feet of floor space ready for use September 1—Consolidated dedicates its new facilities to the continuous development and production of aircraft which will ensure our Nation's Power in the Air.





as Los Angeles, Albuquerque, and Kansas City. Lane President Frye was quoted as saying that the investigation would use code rather than force.

With two 20-day excursions from the Chicago base each week, Victor's Airline has had half the fleet of 58 Boeing transports converted by the end of June, expected sometime in July to be able to have its entire transcontinental route using the faster models. The rest of 16 for all flights east of Chicago, and a rearrangement of its schedules have already permitted it to offer an overnight service from New York to all important cities on the Pacific Coast. With its latest expansion United is flying a million and a half miles a month. Incidentally it has ordered to update its Chicago-Kansas City service.

## Sailors Return

Navy fliers active at maneuvers' end. First cohorts selected

No more such intense "battles" as that staged in May at Midway Island were held during the later part of Fleet Problem 16, but the fleets' aircraft continued intense activities. The five patrol boat squadrons which flew missions from Pearl Harbor to Midway had returned by May 27, four of them stopping overnight at French Frigate Shoals. The planes from the carriers waited together, some 200 strong, for the fleet's return every at Honolulu, for battle formations exercises held 1,500 miles south and west of San Diego, and for a final demonstration on the first morning out San Diego harbor on June 10. The two patrol boat squadrons which had flown by the coast to Dutch Harbor, Alaska, returned to southern California late in May. Scheduled for the summer months are two operations exercises for patrol squadrons at Pearl Harbor, San Diego, and Panama, and concentration of all carrier units at San Diego until late in August.

Admiral, the month was marked by a announcement that the first class of flying cadets had been selected and was about to start training. Designed eventually to add 500 qualified pilots to the Navy's reserves, the cadet program will call a total of 720 candidates in six groups at intervals of a month for preliminary and elementary training at reserve bases prior to entrance at Pensacola.

## Incident Closed

Final verdict on Congressional charges against Foulkes

Little over a year ago a House Military Affairs subcommittee investigating aircraft procurement raised one report breaching the Air Corps practice of awarding contracts by negotiation,

followed it with a second demanding a complete overhaul of the Corps before awarding the renewal of its debt, Maj Gen Benjamin D. Foulkes. Strong and bitter was the committee's resentment of that officer. He had, as they charged, (1) violated existing laws in the purchase of aircraft and materials, (2) made an unusual estimate to the Post Office Department of the Air Corps' readiness to fly the air mail, (3) been guilty of incorrect color and misleading statements in his testimony.

Finally, last month, Secretary of War Dene made public the findings of the Inspector General of the Army who had thoroughly investigated the charges. The evidence adduced did not establish that General Foulkes violated existing laws. . . . there was no cause for censure in General Foulkes' personal statement with regard to . . . the air mail. General Foulkes did depart from the ethics and standards of the service by making exaggerated and misleading statements to a Congressional Committee. Approved by Secretary Dene, a reprimand to the General on the third count.

## Corps Observations

Focus of interest from the Air Corps' month

A total of 163 students, 143 from civil life, last month began training at Randolph Field, San Antonio, as this year's July class. Strategy and basic stages of flight instruction will continue from academic work. Successful graduates there serve a year's active duty.



180TH BCS  
SECOND CONSTRUCTION TO THE Douglas factory last month nearly a year from the day the B-26 was placed in active service.

leading to reserve construction at Douglas Langhorne followed by still another twelve months' reserve assignment on the availability of funds.

Another step in carrying out the Baker Board's recommendations has been taken in the new personnel classification flight tests at Randolph Field for officers who have been placed in a new flying status and who object to that classification.

The Wilson bill, which in May was the subject of international comment where incidental testimony on its Canadian border aspect was referred to the press, last month passed the House without dissent. It was sent to the Senate.

Development work at Wright Field on the Harvard first semester has resulted after years of experimental modifications in the successful application of the design to several modern engines. Power increases in 10% to 12 per cent and substantial fuel economy are some of the advantages reported.

## England

No more Gipsy Moths. Empire Air Day. Expansion Plans

AFTER ten years of production, the age-codged Gipsy Moth, standard throughout the Empire for training and sport flying, will be retired from regular production, according to announcement from the Duffell-Hillier Aircraft Co. Some 4,000 have been built. Their replacement, the Havant Moth, a side-by-side cabin-mounted two-seater biplane with folding, retractable wings.

Reports on this year's Empire Air

# MAKE YOUR SELECTION from GENERAL'S COMPLETE AIRPLANE LINE

General Streamline tires have higher rate of adhesion—greater ability to stand maneuvering—reduce ground friction coefficient.



General Intermediate type combines the greatest advantages with long life and strength in the construction.



Streamline Tail Wheel extends the advantages of streamlining to the tail wheel.



General High Pressure type, the service life of this tire reflects General's long experience in building airplane tires of all types.

Whatever your individual requirements may be, General builds a tire to fit the job.

The revolutionary Streamline tire, originated and perfected by General, is the latest development in airplane tire efficiency. Streamline tires are standard equipment on Army planes and widely used by the Navy. Other Streamline tire users include Pennsylvania Airlines, Beechcraft, Bellanca, Seventy, Sikorsky and Kinner.

General's High Pressure and Intermediate tires represent the utmost in safety and long service for these types of tires. Correspondence regarding your tire problems is invited.

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LOS ANGELES

IF IT'S *streamline* - IT'S A GENERAL



Ray, held late in May, labeled it the most successful yet. Larger crowds turned out in spite of unfavorable weather. R.A.F. officers confided themselves in flying demonstration and larger numbers of equipment. Belknap is pleased in an explicit use could Royal Air Force Display scheduled for June 25.

## Work in Progress

**Bellanca reorganizes. Atwood plane completed. Other items from the industry.**

ADMINISTRATIVE CHANGES, an enlargement of the plant, more emphasis on military plane production, are expected to follow a reorganization of the Bellanca Aircraft Corporation announced last month. Temple N. Joyce, ex-Navy flyer, once with Curtiss, later president of Bellanca-Joyce and co-owner of General Aviation, has been appointed chairman. George M. Bellanca becomes chairman of the board. Substantial additional financing is understood to have been effected from New York sources.

Curtiss Aeroplane and Motor at Buffalo, will order up to its new \$2,700,000 new contract, has reemployed over 600 men. Chief development against centers on a single-seat period still un-dropping flight test. A low-wing monoplane, all metal, with glass reinforced cockpit, landing compartment in the wing and retracting landing gear, the ship is powered with a twin row Wright Whirlwind, is said to be faster than any military aircraft in the country.

A new wing method of construction is incorporated in the new light plane designed last month at Midland, N. H., by Clarence Chamberlain. General and limited under the direction of Harry N. Atwood, pioneer flyer, designed and stress analyzed by Prof. Geo. C. Kappan and Joseph S. Howell of M.I.T., the little low-wing American powered monoplanes weighing less than 600 lb. gross, is expected to have made 120 m.p.h. in its first flight. Each of its main parts, including wing, fuselage, ailerons, and tail surfaces is built as a single integral unit (without bolts, rivets or wires) from a material called Dural. This stage of work are designed under heat with a thermoplastic material then woven, heated, folded, around wooden forms. Parts and covering are then cooled by a steam process, sealing the center and plastic together.

Koffman Instruments Co. has established a factory branch to handle the company's business west of the Rocky Mountains at the Grand Central Air Terminal, Glendale, Cal. G. Charles Goodrich, for several years an engineer at the Brooklyn plant, is in charge.

The recent decision to expand the Air Force will require the recruitment and training of about 2,000 pilots and 30,000 mechanics and enlisted men during the next two years, some 50 per cent being sought by next April. Meanwhile the aircraft program is being substantially speeded. First step, simplification of procurement procedure.

Bendix Aviation has acquired the assets and good will of the Harley-Townsend Corporation, manufacturers of aircraft glider ships, will merge them with its subsidiary Bendix-Vought Co. Transferring the manufacture of B-T glider to the Seattle plant at Skyway, N. Y., the company announced it would shortly start the production of a new line to be known as the Bendix B-T, would manufacture a through regular Seattle distributors and service base.

## What's Around That Corner?

THE present trend of public works policy is favorable to the kind of job that has to be done on airports, but there is little chance of a general adjustment of \$100,000,000 or more per year for the next few years. Projects will probably be approved individually, and only to complete data are submitted. The total amount for airports may approach \$15,000,000, is unlikely to go higher.

Airport construction work will maintain interest in financing. It should increase the number of states projects issued in the last few months of this year to be shown the corresponding 1934 level. Opportunities for flying schools will be removed accordingly.

The Mac-McGrath bill, should become law by the time this issue of AVIATION appears, or within a week thereafter. The Interstate Commerce Commission still has much to do before complete reconciliation or compromise is in confidence with the new law can be ready, and the first orders serving rates of payment upward on the rates already underpaid lines ought to meet about Sept. 15.

Plans for shorting new bonds for

## Financial

**Aviation Corp. distribution. United Airlines, West quarterly reports.**

IN DISBURSING with the Air Mail Act, Aviation Corporation last December delivered the stock of its operating companies to stockholders' trustees. Recently announced is a plan, effective July 1, for the distribution of these holdings. For each old Aviation Corporation share (par value \$5) one new share in Aviation Corporation (par value \$1), one new share in American Airlines, one (new) share in Canadian Airlines.

United Airlines reports for the first 1933 quarter a gross income of \$1,604,828, an increase of \$194,136 over income for the same period last year but still insufficient to prevent a loss, which amounted to \$69 cents a share. A breakdown of the gross income figure showed air transport passengers and express freight \$50,072, express \$20,131, mail \$68,775, miscellaneous \$162,232. West's 1933 quarter income was \$1,025,000, net of sales \$365,502, administration, selling and engineering expense \$30,812, other income less deductions \$1,655, net loss for period \$32,602.

AVIATION  
July, 1933

AVIATION  
July, 1933



*From Kalamazoo Direct to - -*  
**NEW YORK • BOSTON • WASHINGTON • MIAMI**  
**NEW ORLEANS • DALLAS • WEST COAST**

STINSON Transcontinental Airlines, operated by American Airlines, has reopened a great transportation market in the five new people from Detroit and Chicago.

A year ago Kalamazoo travelers lacked fast air service. If they wished to visit New York they generally used the railroad. Now, they lost time and the Airline lost revenue.

Now the people of all five cities may leave home or office at the close of the day, are speeded to Detroit on American Airlines' Stinson Transcontinental Airlines, make quick connection there with a through plane and arrive in New York at 10:30 P.M.

They may leave home in the morning, spend the day in Chicago and remain home in the evening, or make fast connection at Chicago arriving in St. Louis, Louisville, Tulsa or Oklahoma City that afternoon; in Atlanta, New Orleans, Miami, Dallas or Ft. Worth that evening and in Los Angeles at least for work the next morning.



THE STINSON TRANSCONTINENTAL AIRLINES, AMERICAN PARTNER AND NOT ECONOMIC SERVICE

This fine service has been made possible by the Stinson Transcontinental Airlines, fastest of its type in America, and built specially to give high-speed service on frequent stop runs and to "Parallel Feed" the through services.

"Parallel Feeding" means providing modern high-speed service to hundreds of important cities on main Airlines which are now neglected or poorly served. These cities are entitled to and will support better service, just as Kalamazoo and its sister cities have responded to the fine service schedules made possible by Stinson Airlines.

To better serve their territories Delta and Central Airlines have ordered fleets of Stinson Transcontinental and will shortly merge the fastest services between Dallas, Tyler, Shreveport, Monroe, Jackson, Meridian, Birmingham and Atlanta; and between Detroit, Cleveland, Akron, Pittsburgh and Washington.

**STINSON AIRCRAFT CORPORATION**  
DETROIT AIRCRAFT MANUFACTURING CORP.  
**WAYNE, MICHIGAN • U. S. A.**

# The Successful Sealing Compound For Aviation Use

★ DEVELOPED FOR THE  
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**STOPS LEAKS PERMANENTLY**  
OIL — GAS — WATER — STEAM — AIR

Throughout the aviation industry, Fostoria TiteSeal is the specified sealing compound for engine application. Originally developed for the United States Army Air Corps, Fostoria TiteSeal has completely provided a permanent leak proof sealing compound for the various requirements of aviation use. Fostoria TiteSeal seals perfectly against oil, gas, water, steam and air. It will not dry out. It is indestructible. Heat and solvents have no effect. It goes tightly even under the most severe vibration. It will not shrink, crack or crumble. For every leak sealing requirement, Fostoria TiteSeal provides these exclusive advantages. It is the only successful material for aviation use.

**NOW USED BY** leading airplane motor manufacturers, six line companies, and the United States Government.

**THE FOSTORIA PRESSED STEEL CORP.**  
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**SEAL TIGHT WITH TITSEAL**

Indestructible — Non-Hardening — Non-Solvent —  
Fight-Gripping — Heat-Proof — Vibration-Proof — Will  
Not Shrink, Crack or Crumble.

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**Complete, \$119.50**  
**RCA Receiver Models AVR-7, 7A**

SHIPS must have radio today—but it must be reliable, economical, light, strong, sensitive, self-contained. The new RCA Models AVR-7 and AVR-7A Aircraft Receivers meet all these requirements. The price of \$119.50 includes tubes, power supply, headsets and all connecting cables, making these the lowest-priced aircraft receivers of power now available today. AVR-7 offers the heaviest and most-invariant band; AVR-7A, the heaviest and most-invariant band. Installation is simple and quick. There are only two units, each mounted by means of four screws.

## AVT-3A AIRCRAFT TRANSMITTER

Made to the same strict high-quality specifications. Complete in a single unit excluding dynamotor power supply. Operation on any three preprogrammed frequency channels in flight, between 250 and 3,000 kilocycles. Power, an exact, precise transmission on CW, modulated CW, and voice, without changing.

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**AVIATION RADIO  
SECTION**

RCA MANUFACTURING COMPANY, INC.  
CAMDEN NEW JERSEY

# Schools, Services, and Airports

●ALABAMA—Gannett's new mammoth support at Gannett was dedicated May 25 and 26 with a well attended show. The Aviation Supply Division of the Montgomery Institute of Aeronautics, which has been doing an active business in parts and accessories, reports the sale of a new P-40 to Jack Forthner of Montgomery, Miss. The SYCAMORE AVIATION Club has been organized with twelve members signed up for flight training. Instructor, William A. Hood of Auburn.

●ALASKA—Alaska Transport Inc. has been formed in JUNEAU to take over the operations and other assets of the now defunct Pribilof Air Transport (Pribilof). Sheldon Simmons will be pilot-in-command of the new charter service. Robert Meyer, formerly of Seattle has set up a charter service in Ketchikan with a Waco cabin plane. The Department of Commerce has formulated a plan to build fields with adequate runways at towns on seven routes, which would form an airway network over the whole Alaskan Territory of the United States. Total cost \$2,800,000. Simultaneously the Department of the Interior plans to expend \$271,000 in the construction of numerous airports and landing strips for the navy.

●ARIZONA—A large delegation of pilots and planes from Phoenix Sky Harbor flew to El Paso field at Prescott to take part in the National Day against them. Paul Olson was the first landing contest. The Great Western Airways has applied for permission to establish a daily scheduled service between Tucson and Santa Lucia City via Phoenix and Prescott. Proposed equipment, two Lockheed Oivons. Work is being pushed at Saltzman on improvements to the regional airport runway. A private hangar is being constructed by Jack Fitch.

●ARKANSAS—The program for the improvement of the Little Rock airport, which was initiated to permit the use of the field by American Airlines' new equipment, is now completed with the exception of the placing of obstruction lights on neighboring hills and approach. The Little Rock Flying Club has been making active



## NO FREE-FOR-ALL

was the recommendation of Frank Bruck and Chris Herring to the officers of the prominent Round Aviation Society after completing a survey at South and Central Airports. Using a Wright-powered Stearman biplane, the team tested for a month under a severe weather storm in September. (Continued on 10 lower left column.)

use of its ship, Walter Bennett acting as instructor.

●CALIFORNIA—A large number of planes from all over the state and a squadron of Air Corps bombers turned out for the annual Legion aircraft at Fresno late in May. Airports also marked the dedication of the California airport June 1 and 2 and of Ralph Field at Sonoma June 13 and 14.

Claver Field groups have recently added substantially to their flying equipment. David Lindstedt, a Wright-Williams crew Pacific Air Service, an Aeromarine National Flying System, an Eagle, Corona Plus Flying Club, a Stearman, Lloyd Larrin a Meier biplane. A mixed flight of the volunteer air squadrons of the Sheriff's of San Diego and Los Angeles was scheduled for June 9. Biweekly Occasions, Area California, the San Diego Exposition. Peter Dick, Ryan School graduate, completed a flight May 23 from San Diego to Tucson, Ariz. It was his seventh transcontinental crossing from his own place. A touring group has been

formed in the Southern Aeronautical Association. First came, in May, to Airport improvement projects among Relief Administration action last month were reported from Sonoma, Fresno, Pitts, Porterville, and Hollister. Because of impaction over the city route to the property SERRA residents have withdrawn support from the work in progress on San Antonio Municipal Airport. The project will probably be completed directly by the city.

●COLORADO—A campaign to have the Air Corps technical school, now located in Denver, moved to Denver which has been vigorously pushed for several months by various civic bodies, resulted in first major objective last in May when Denver citizens voted by a large majority for a \$750,000 bond issue to raise funds for the purchase of a site. Final success depends upon Congressional approval. The Colorado National Guard has filed applications for \$150,000 with the Public Works Administration for the construction of a hangar

and an administration building for the Twentieth Observation Squadron. Opening of the funds will probably mean that the squadron is the Municipal Airport from its present quarters at Leary Field.

●**CONNECTICUT**—Among the papers at the air meet held at Branford Field, Housatonic June 16, was an Governor Trumbull's aviation-sponsorship. Ted Wiley, last year in charge of the Lehigh Valley (N. Y.) airport, has been appointed manager of the field at CAWANA. . . . The present status of the state legislature is considering a bill reducing the tenure of office of the state's air aviation administration from five to three years.

Funds have been made available for the improvement of the runway at Midway airport in Stratford.

●**DELAWARE**—Richard C. duPont of Wilmington has opened the Bonduch-dePont School of Flying at Wren Field near Seaford, Pa. . . . The Wilmington Chamber of Commerce has leased Belmore Field at DUNSMARK, Mo. in the Port of San Francisco for 21 years, the Bureau agreeing to operate, maintain, and repair the field's lighting system.

●**FLORIDA**—Map A. B. McMillan, director of the Aviation Division of the State Road Department and of the Aviation Division of the Florida FERA, has prepared a report which is not only a record of the past

years' achievements, but a comprehensive ten-year plan for the development of Florida's aeronautical facilities. Highlights: Present mobile airports 120 of which 48 are being enlarged or improved; 14 additional are under construction; ultimate quota 150; present air markers 188; ultimate quota 280; 60 to be illuminated; recommendations for increased hangar facilities; lighting, radio education and promotion, scheduled services, mapping and meteorology. In appreciation for Major McMillan's efforts the Florida House of Representatives has passed a resolution of commendation.

●**GEORGIA**—F. M. Tatum and C. N. Roberts have been given permission by the City Council to erect a post office at the Savannah municipal airport. . . . Assured by the possibility that *Martin* may be dropped as an annual stop, authorities of that city are considering extensive improvements of Miller Field.

●**ILLINOIS**—The city of Monmouth has purchased the hangar at its municipal airport from the members of the now-defunct Midwest Airways Corps and plans to reconstruct it and the field's lighting facilities. . . . Two more previously owned planes a Command-Air and a Travel Air, have been added to the eight already quartered at the Monmouth airport. . . . In case of recent adverse reports for an investigating committee the proposed to build an island in Lake Michigan to be used as a

CHICAGO air terminal continues to be considered. The city's Aldermen recently voted 40 to 2 for a resolution urging such a project. . . . Arthur Cawston, acting manager of the Eisenhower airport, has recently purchased an Aeromax, raised the number of planes at the field to six. . . . The Executive Flying Service has purchased a tractor formerly used by American Airlines. . . . L. P. Bradley of Quincy, for two years chairman of the city's aeronautics commission, has been made a chief on Governor Horner's personal staff. . . . A firing club with 20 members has been organized at Kewanee. G. Andrew Rivers will serve as instructor.

●**INDIANA**—The new Purdue Airport at LAFAYETTE was opened its first season late in May when stunt fliers, sportsman pilots and several service squadrons participated in a program sponsored by the local Legion, post 1. . . . Forty-seven planes landed in the recent years had found the seventh annual Indiana Air Tour as it left Indianapolis June 17.

●**KANSAS**—George Henke, who will recently operate the Harte Air Service from the Central Avenue airport, has moved his company to the Wichita municipal field. Purchasing and maintaining the stores hangar at the east side of the field, Henke who also acts as test pilot for Cessna and Beechcraft, will continue his school, charter, taxi, and business activities, is expected to add materially to the volume of the field's business.

●**KENTUCKY**—A fund of \$5,000 is being raised for a complete lighting installation for the new municipal airport at LEVINSON. Fayette County has already appropriated \$1,000 as its share of the project.

●**LOUISIANA**—The campaign which started in April to raise funds for a specially designed propeller for the Delgado Vaud, the racing plane built by the Delgado Trades School has been enlarged in purpose to include the purchase of a new engine. Enlisting lantern clubs, civic groups, and others, the plan's sponsors are now seeking \$7,500.

●**MAINE**—Portland's newly completed Broadview airport has become remarkably active. Pilot Francis G. Paul has soloed one of its first students and no less has been used for a night landing. . . . How 42 has been set for the opening of activities of Fair Harbor's municipal field at TANTON.

●**MARYLAND**—A crowd of 3,000 turned out for the Decoration Day meet at Curtis Wright Field, Baltimore. A National Guard squadron staged a mock



# Announcing BENDIX H-T AIRCRAFT SPARK PLUGS

MADE BY SCINTILLA MAGNETO CO., INC.

**S**CIINTILLA engineers have developed a new spark plug for aircraft engines, having many features not hitherto seen in spark plug practice. This will shortly be placed on the market in types adapted to leading aircraft engines.

In addition, the assets and manufacturing facilities of the Hurley-Townsend Corporation have been acquired and will be re-located at the Scintilla plant in Sidney, N. Y. This enables the Scintilla organization to supply a complete line of aircraft engine spark plugs for every requirement.

The merchandising of these spark plugs to the trade will be handled by Scintilla Aircraft Magneto Distributors and Service Stations, which are located at most of the large airports and at other points throughout the country.

The addition of spark plugs to the present line of aircraft magnetos, battery ignitions, switches, etc., is a logical development which will enable Scintilla to serve the aircraft industry even more effectively than in the past.



**SCINTILLA MAGNETO CO., INC.**

(Soleholders of Bendix Aviation Corporation)

SIDNEY, N. Y.



**HARTFORD PLAYS HOST**

to thousands of pilots of the field annual American Legion Air Show June 16, at Hartford Field. The meet attracted an enormous, to insure the efficiency of improved landing areas and other improvements planned under the direction of American Army Field during the past six months.



pen, has announced tentative plans to operate a feeder line over the route—Watson, Syracuse, Corfu, Elms, Savannah, Nashville, Jacksonville, and Albany. The New York State Airport Managers Association met in Syracuse on June 4. Chief topic of discussion, the establishment of service charges throughout the state. Plans for an airport at Saratoga Springs are being rapidly pushed. Work has been resumed on the runway of Andes airport, Syracuse. Russell Hoffmann, president and general manager of Donald Woodard airport near Rochester, has purchased a new plane to be used in place of a glider. On June 2 out of line in a glider from an airplane tow at 7,000 ft., he crashed 800 ft. before landing. Being an unofficial record. Relief checks of \$50,000 are being sought for the improvement of the field.

●NORTH CAROLINA—W. E. Gentry and E. S. Barlow have been carrying out an experimental aerial survey of Wake County from Raleigh airport. Object, to test the effectiveness of such work in checking forest compliance with AAA agreements. The Carolina Aero Club held their May meeting at Waco, N.C. May meeting in Lexington. Plans are being formulated for a state wide air tour. . . \$5,000 has been allocated for planning Miller field, at Winston Salem in Bernards grant.

●OHIO—A campaign is underway to have Yachtwreck repairs and improve Waco airport. . . John Johnson will be in charge of flight instruction at Lakeland airport, Cincinnati, this summer for the Venable-Huffman Company. Edward Moore, manager of the Lakeland airport, was winner of the speed race at Waco, June 8.

●OKLAHOMA—Plans for the Tulsa Southwest Air Race scheduled for June 20 and 30 dated from plans to improve all during the month. Lee Miles had already received the municipal airport was made available for the Park Board, a grandstand was delivered. 16,000 tickets out to use an air show at the Oklahoma City airport late in May.

●OREGON—The Sportsman Pilot of Oregon made their first trip to Albany on May 25. A total of twenty planes taking part. . . V. Claude Boyd, head of the Ryan Aircraft Company, made delivery last month of a new Ryan S-1 to Leonard R. Peterson, Inc., at Seaside, Calif. The Peterson Company will be distributing the ship there for the California Aerial Company, at Swan Island, Portland, has been awarded an approved school certificate by the De-

partment of Commerce. It is operated in conjunction with the Oregon Institute of Technology. . . The Provisional Airline Association of Oregon which now has 31 members has drawn up a code of pay for pilots as follows: Monthly salary, \$250, at \$100 less salary with 42 per hour for dual instruction and \$5 per hour for solo instruction. Straight hourly rate \$3 for dual instruction, \$2.50 for basic solo flight, including standing, .40 per hour for solo instruction. Passenger flights 30 per cent of gross to pilot.

●PENNSYLVANIA—Johnson Field, near airport in the Pittsburgh district, was opened on May 1. . . Stewart airport held its 4th annual meet May 21 and 22. A meeting of the Dauphin Field was called for June 17 to plan an attempt for that district. \$20,000 of LWF funds have been made available for improvements to the Castleville airport. Work has been started on the expanded runway. . . The Pennsylvania airport association met at Harrisburg on May 15. . . James R. Jones has been appointed manager of Lancaster's newly enlarged airport. . . Scott C. Cook, who has been acting as temporary manager of Harrisburg airport, has been transferred to Indianapolis by TWA. William B. Moore has been made permanent manager. . . Gay Miles, manager at Wings Field, Pennsylvania, reported the sale of a new de luxe Waco to Col Robert Montgomery.

●RHODE ISLAND—The work of buying the concrete runways was begun last month at the state airport at Hockanock as bids were sought for concrete additional lighting equipment.

●SOUTH CAROLINA—The new state commission has named J. P. W. Baker as director of aviation. . . Thomas C. Martin, one of their city, director of state aviation. The Hawthorne Flying Service of Charleston has received a Taylor Cub for the use of the new students now enrolled. . . B. P. Perdue, manager of the Columbia municipal airport, has purchased two Taylor Cubs, bringing the total of planes used at the field to five.

●SOUTH DAKOTA—State College at Brookings has been authorized to establish a two-year trade center for training aviation mechanics.

●TENNESSEE—Carroll Holman, manager of Lovell municipal airport at Chattanooga after its opening five years ago has resigned. . . Commencement of the Tennessee Civil Aircraft "Drive Plan" to give regularly for Sunday morning flights. The state aviation commission, presided

only inspection because no funds are provided for an airplane or for salary of the director it is expected to appoint, is making an attempt to secure funds for its use from the state authorities. . . A delegation of city officials from Nashville traveled to Washington last month to secure funds to enlarge the municipal airport.

●TEXAS—Landed by army regulations, the second of time they can be used on a service agreement, ten members of the 36th division based at Houston has landed the Air in the State Flying Club purchased a Taylor Cub. . . Army officials observed Army day on May 15 with a meet and an exhibition of 40 types at Houston Field. . . W. P. Lee, Dallas, Texas, has been incorporated a new operating company as the CFI Field Airlines of Dallas.

●VERMONT—Barnegat has received funds for \$20,000 to be spent in the state of the extensive improvements being made to the airport at the municipal airport and the maintenance of the field's administration building.

●VIRGINIA—The University of Virginia Air Station Club has elected Howard E. Kiser, president and W. B. Franks, vice-president and treasurer. Flying instruction has been started in a plane belonging to Franks. . . The Flight Club of Williams and Mary College was planning to send a plane and instructor to the National Intercollegiate Flying Meet at Purdue, Ind., on June 25. . . Nearly 10,000 turnout at Roanoke May 25 for an air show. Clayton Lewis, instructor of the field, has purchased a new Waco open plane. The lighting of the Washington-Nashville route has been completed was scheduled to be turned on June 15. Extensive improvements are planned as airports at Dulles, Newport News, Winchester, and Petersburg.

●WASHINGTON—The Spokane Flying Club has purchased a Student Prince trainer from Richmond Radium of Portland, Ore. . . WALLA WALLA held a seasonal air show late in May, on 4th Saturday on June 1.

●WEST VIRGINIA—The Kanawha Flying Club of Charleston has 113 hours in the club's new Aircoast due for the first three weeks after its delivery in May. . . Improvements at the Elexis airport to cost \$20,000 have been approved by state-related authorities. . . Definition of Phoenician's municipal airport, upon which \$60,000 has been spent in a business month project, was scheduled last month. . . Charles E. Hunt, state aviation inspector, has opened a flying school at the Tri-County airport near Charleston. Will use a Fleet trainer.

## THE NEW PORTERFIELD

### Announcing . . .

the first 100 horsepower airplane with 70 to 100 horsepower performance—the first plane of this type to sell for under \$5,000. Best these typical voluntary testimonials out of approximately 100 which have been received:



Arthur G. Bennett, Houston, Texas: "I made 100 mph in 10 seconds. The plane is very fast. It is only one day before it will be in the air. The plane is very fast."

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John F. Bennett, Houston, Texas: "The plane is very fast. It is only one day before it will be in the air. The plane is very fast."

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Wright Cyclones power the 210 mile-per-hour Douglas Air-liners now in operation on Pan American's division from Buenos Aires, to Panama, via Mexico City. Cyclones also power the new Pan American-Cruzair subsides from Guayaquil, Ecuador, and Lima, Peru, to Buenos Aires, Argentina, and Montevideo, Uruguay—along the west coast of South America to Santiago, Chile, and across the Andes Mountains.

The American new Pan American Airways planes are similar to the TWA Douglas transports that speed overnight from New York to Los Angeles . . . dash between Chicago and New York in 4½ hours on American Airlines . . . and span the distance between New York and Miami in 8 hours, via Eastern Air Lines.

Wright-powered equipment is also operated by the Pan American Airways System on its divisions in Alaska (Pacific Alaska Airways, Inc.) and in the Far East (China National Aviation Corporation).



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THE Glenn L. Martin Company's outstanding achievement —the magnificent new Over-Ocean Transport, true to tradition, carries a representative complement of Eclipse units. Eclipse Type E-160 Direct-cranking Electric Starters serve the four 800 horsepower Pratt and Whitney Wasp engines. Solenoid Starting Relays, Battery Booster Coils, Engine-driven Single Voltage Generators, and Control Boxes are likewise Eclipse.

ECLIPSE AVIATION CORPORATION  
EAST ORANGE, NEW JERSEY

*{Subsidiary of Bendix Aviation Corporation}*